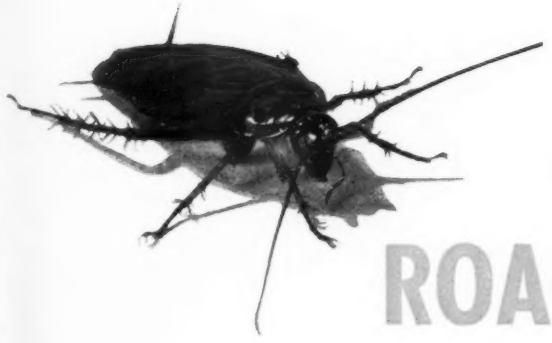
PEST CONTROL

JUNE 1960



ROACHES

VPI Reports Results of Tests with Prospective Roach Chemicals Pg. 9

Can You Distinguish the Cockroach Twins? Pg. 12

USDA Testing Value of Roach Repellents Pg. 14

New Light on Diseases Food Roaches Carry Pg. 22

Does Geographical Location Affect Grain Infestations? See Kansas Study . . Pg. 16

PCO Shrub, Tree Insect Control . . Pg. 26

Rate of Termite Attack on Sound Wood . . . . . Pg. 40

Purdue Attempting to Fix Termite's Diet . . . . Pg. 43

For "Advanced" Equipment Maintenance, See Pg. 58

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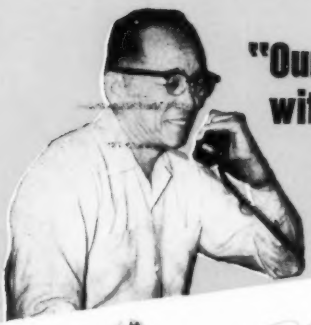

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President and Manager
Chemi-Pure Products, Ltd.
Honolulu, Hawaii

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Subject: Use of 1% Chlordane for Subterranean Termite Control

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On large scale operations for Capehart projects at Schofield Barracks, Tripler Army Hospital, and Fort Shafter, 1% Chlordane was used for sub-slab treatment in preference to other recommended chemicals.

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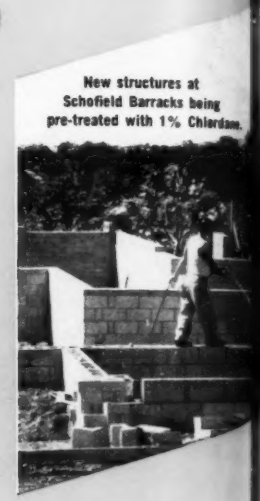
On the question of 1% vs. 2% Chlordane, we have arrived at the conclusion, through our experience, that the lower limit of concentration, 1%, is more than adequate in affording effective subterranean termite control.

Yours very truly,
CHEMI-PURE PRODUCTS, LTD.

Dan T. Nishimura

Dan T. Nishimura
President and Manager



New structures at Schofield Barracks being pre-treated with 1% Chlordane.

Mr. Lawrence Ninomiya
Assistant Manager
Chemi-Pure Products, Ltd.
Honolulu, Hawaii

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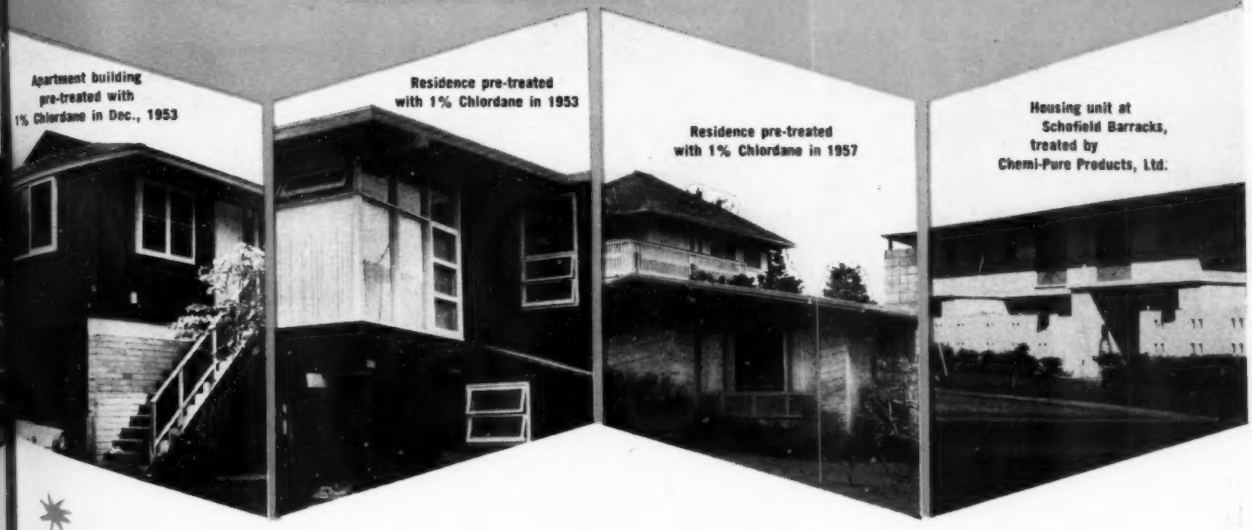
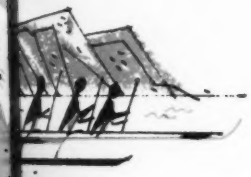

Apartment building pre-treated with 1% Chlordane in Dec., 1953
Residence pre-treated with 1% Chlordane in 1953
Residence pre-treated with 1% Chlordane in 1957
Housing unit at Schofield Barracks, treated by Chemi-Pure Products, Ltd.



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In This Issue:

Results of 1959 Cockroach Control Tests at VPI
by Dr. J. M. Grayson and B. D. Perkins 9

The Cockroach Twins
by Michael T. Palermo 12

Laboratory Evaluation of Cockroach Repellents
by G. S. Burden and J. L. Eastin 14

Effects of Geographical Location on Infestations
by Grain-Damaging Insects, by John R. Pedersen 16

Diseases Carried by Food Service Cockroaches
by Charles Masters 22

Shrub and Tree Insect Control for PCOs
by Dr. Donald L. Schuder 26

Latest Legislative Action
Affecting the Pest Control Industry 34

Serviceman Training and Retention
by H. William Ives 36

Termites and Their Attack on Sound Wood
by Anders E. Lund 40

Nutritional Studies on Subterranean Termites
by John Kerr Bready 43

Registration of Two New Insecticides for
"PCO Use" Announced at CSMA Meeting 46

Regular Features:

Letters 6
News 48
Primer 52
Calendar 55
Infestation Report 56
Notebook 58
Classifieds 60
Advertisers 60
Pestales 62

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Mad Rush for Legislation

Alarmists, publicity seekers, the misinformed, or professional trouble makers have increased the number of hastily prepared laws being tossed into legislative hoppers to restrict the use of pesticides.

The overall picture of insecticide hazard, painted in recent popular publications by authors who do not have all the facts, is more imaginary than real. Dr. Edward F. Knipling, entomology research director for the U. S. Department of Agriculture's Agricultural Research Service, warns that such misstatements of facts have led to more stringent laws and rigid interpretations of them. Thus it is becoming more difficult to maintain essential control of insect pests with available methods, and to develop new ones.

Proclamations from misguided individuals say modern-day insecticides are poisoning the food we eat. Recently some claim certain pesticides cause local adverse effects on fish and wildlife.

Under existing law, application of insecticides must be not only non-hazardous to man, but must also meet other requirements regarding their use.

Dr. Knipling says he has seen no evidence of an overall decline in the Nation's resources of fish and game caused by insecticides. And, according to Dr. George C. Decker, entomology section head of the Illinois Natural History Survey, "The impartial observer may be pardoned if he considers the loss of a few song birds attributable to the spraying of elm trees less harmful than the permanent loss of such trees, with the accompanying disappearance of nest sites."

Every commercial pest control applicator should be aware of pending pesticide legislation in his city, county, or state, become familiar with it, and let legislators know how he feels about objectionable sections. This should also be the responsibility of pest control associations in the areas affected.

Concerted and intelligent guidance from members of the urban and industrial pest control industry will help slow down the mad rush for useless and unnecessary pesticide legislation.

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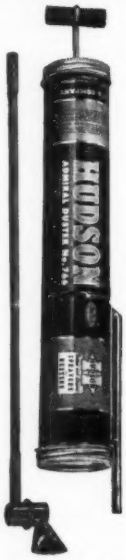

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Letters

Signs vs. No Signs

To those PCOs who advocate signs on their cars, let me remind them of this: clergymen, doctors, lawyers, and other professional men do not have signs on their cars, and yet those professions, as everyone knows, are the most respected of all.

PCOs only lower their status when they employ carnival tactics. All PCOs could do business in a much more refined way than they are now . . . and the public would appreciate it.

Ed Batzner

Milwaukee, Wisc.

Kudos from the USDA

It has been a long time since I've written you and thus I have had no opportunity to tell you how much pleasure I get in reading *Pest Control*, or how great the improvement has been in your magazine in the last decade or so. We see many trade magazines in this office, but I see none I think are superior to yours.

David G. Hall

Chief, Publications Branch
Agricultural Research Service
U. S. Department of Agriculture
Washington 25, D. C.

Next to Bankers

In a "Report to Business" by the Better Business Bureau of Pittsburgh recently, detailed figures of cases of dissatisfaction on business transactions show a marked increase in complaints.

The report shows the worst classification to be "guarantee not fulfilled." Worst offending group is the Home Improvement field, with TV sales and service showing the largest increase in complaints over the previous year.

According to information supplied me by G. H. Dennison, General Manager of the Pittsburgh BBB, the Exterminating Industry *placed second* in the field of 47 business classifications in the *absence of complaints*. Only the banking industry registered less complaints by the public. This significant honor represents a maturity not yet fully identified by the business world.

Harry Katz

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Results of 1959 COCKROACH CONTROL Tests at VPI[1]

by

DR. J. M. GRAYSON and B. D. PERKINS

Department Head — Graduate Student

Department of Entomology

Virginia Polytechnic Institute, Blacksburg, Virginia

Dr. Grayson in his insecticide testing laboratory at V.P.I.

RESISTANCE in the German cockroach is now widespread over the U.S.A., especially in the southern part, and it extends to many chlorinated hydrocarbon insecticides as well as to pyrethrins (Keller et al., 1956; Spear, 1958). There are reports of natural populations which have become difficult to control with certain organic phosphate insecticides, but apparently the only experimental evidence to indicate confirmation of such resistance is that reported by DuChanois as suspected resistance to malathion in German cockroaches (personal communication). On the other hand, resistance to malathion has been demonstrated in laboratory-selected strains (Burden et al., 1959; Grayson, unpublished data).

The principal objective in studies on cockroach control conducted at the Virginia Polytechnic Institute during the past four years has been to determine the residual effectiveness of promising insecticides and formulations in control of chlordane-resistant and non-resistant German cockroaches (Jarvis and Grayson, 1957; Grayson and Jarvis, 1958; Grayson and Messersmith, 1959). Tempered "Masonite" panels were used as the standard material for treatment, but certain insecticides were further tested on panels of different materials commonly found inside buildings.

Dicapthon as a 1.0 or 2.0% emulsion, and Diazinon as a 0.5% emulsion or oil-base formulation, were found to be the most effective insecticides tested, but both of them have limitations in practical usage. Dicapthon forms an objectional yellow dye under some conditions, and Diazinon gives poor kill on such surfaces as galvanized sheet metal, glass, and linoleum. Promising results were obtained on "Masonite" panels from 2.5 and 5.0% water suspensions of Sevin, a 1.0% emulsion of Korlan, 1.0 and 2.0% emulsions of malathion, and a 4.0% oil solution of Malrin.

The purpose of the study reported here was to continue the search for insecticides and formulations which may be effective in control of resistant and non-resistant German cockroaches. The strains used were the chlordane-resistant and normal ones maintained in the Department of Entomology of the Virginia Polytechnic Institute.

Materials and Procedure

Twelve formulations involving seven different materials were included in the experiment. All of these were tested on tempered "Masonite" panels. The materials were as follows: technical Diazinon (Geigy Chemical Co.); DDVP with Aroclor 5460 (Shell Chemical Co.); Hercules 5727 as a 15% emulsifiable concentrate (Hercules Powder Co.); Dimethoate both as technical grade and as a 46% soluble concentrate (American Cyanamid Co.); Amer. Cyan. 18,706 as a 25% soluble concentrate (American Cyanamid Co.); Dibrom as 50% concentrate (ML-382) (California Spray-Chemical Corp.); and Sevin as 85W for water extension, 85P for extension with oil, and 45MC for water extension (Union Carbide Chemicals Co.). A refined kerosene was used in preparing the oil base formulations.

The procedures in rearing the cockroaches and treating the panels were the same as previously described (Jarvis and Grayson, 1957; Grayson and Messersmith, 1959).

The testing procedure consisted of placing female German cockroaches in battery jars containing three treated panels each. All of the tests were replicated four times except those for the 7- and 15-day aging periods which were replicated three times. From 10 to 20 cockroaches were used for each replicate, the number depending upon the available supply. The cockroaches were continuously exposed to the treated panels for a 3-day period. Mortality readings were taken at the end of one and three days following exposure of the cockroaches to the treated panels.

Results

The results are shown in the accompanying table. Diazinon as a 0.5% oil base formulation gave complete kill of resistant and non-resistant cockroaches after three days of exposure to treated

1. Acknowledgment is made to the National Pest Control Association for grant-in-aid support of this work; and to Dr. P. J. Spear, Technical Director of N.P.C.A., for assistance in planning the work.

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Percentage mortalities at the end of one and three days* following exposure of female German cockroaches to panels which have been dipped in different insecticide formulations and the deposits allowed to age for various periods of time. 1959

Insecticide and Formulation	Cockroach Strain	Age of Insecticide Deposit (Days)				
		2	7	15	30	60
DDVP, 0.5% and 2.0% w Aroclor 5460	Resistant	100 - 100	100 - 100	75 - 100	73 - 100	35 - 92
	Non-Res.	100 - 100	96 - 100	65 - 100	65 - 98	38 - 94
Sevin, 2.0% (Water suspension)	Resistant	81 - 93	83 - 88	44 - 59	72 - 87	80 - 92
	Non-Res.	76 - 90	50 - 68	54 - 67	63 - 76	88 - 98
Sevin, 2.0% (Oil base)	Resistant	100 - 100	75 - 80	60 - 74	51 - 76	62 - 82
	Non-Res.	100 - 100	86 - 94	55 - 73	53 - 70	51 - 63
Sevin, 2.0%** (Water extended)	Resistant	81 - 91	28 - 38	46 - 52	69 - 77	60 - 71
	Non-Res.	40 - 60	43 - 62	19 - 35	58 - 73	65 - 67
Hercules 5727, 0.5% (Emulsion)	Resistant	46 - 61	36 - 38	42 - 44	19 - 23	29 - 33
	Non-Res.	39 - 49	9 - 16	6 - 10	54 - 60	37 - 43
Hercules 5727, 1.0% (Emulsion)	Resistant	98 - 98	93 - 95	67 - 86	88 - 95	82 - 85
	Non-Res.	100 - 100	89 - 93	86 - 94	98 - 100	84 - 90
Dimethoate, 1.0% (Water solution)	Resistant	2 - 24	3 - 13	3 - 9	0 - 16	0 - 12
	Non-Res.	0 - 39	2 - 28	8 - 20	0 - 13	0 - 25
Dimethoate, 1.0% (Oil base)	Resistant	100 - 100	85 - 100	64 - 100	78 - 100	55 - 100
	Non-Res.	96 - 100	87 - 100	79 - 100	57 - 96	58 - 100
Amer. Cyan. 18,706, 1.0% (Water sol.)	Resistant	4 - 9	5 - 8	3 - 12	0 - 5	0 - 2
	Non-Res.	4 - 5	2 - 4	8 - 22	0 - 7	0 - 17
Diazinon, 0.5% (Oil base)	Resistant	100 - 100	100 - 100	92 - 100	87 - 100	78 - 100
	Non-Res.	100 - 100	100 - 100	91 - 100	96 - 100	78 - 100
Dibrom. 0.5% (Oil base)	Resistant	100 - 100	100 - 100	71 - 100	73 - 100	40 - 89
	Non-Res.	100 - 100	100 - 100	48 - 100	89 - 100	27 - 98
Dibrom, 1.0% (Oil base)	Resistant	100 - 100	100 - 100	86 - 100	99 - 100	79 - 100
	Non-Res.	100 - 100	100 - 100	88 - 100	100 - 100	37 - 100

* Under each column the first figure is the percentage mortality at the end of a one-day exposure period, and the second figure is the same for a 3-day exposure period.

** Prepared from Sevin 45MC

panels at all aging intervals, and fair to good kill after only one day of exposure to panels on which the deposits had aged for periods up to 30 days. Good to excellent kill was obtained from 0.5 and 1.0% oil base formulations of Dibrom after 3 days of exposure to panels on which the deposits had aged for periods up to 60 days, and from the higher rate after only one day of exposure to treated panels which had aged for 30 days. A 1.0% oil base formulation of Dimethoate gave excellent kill after 3 days of exposure to deposits after all aging intervals tested. Deposits of 0.5% DDVP plus 2.0% Aroclor 5460 gave good kill after 60 days of aging if the exposure period was 3 days, but after less than 15 days of aging if the exposure period was only 1 day. Deposits from a 1.0% emulsion of Hercules 5727 gave good to excellent kill after 30 days of aging if the exposure period was 3 days, but after less than 7 days of aging if the exposure period was only one day.

The results obtained from 2.0% formulations of Sevin were erratic. Deposits from the oil base preparation gave higher kills up to 15 days of aging, but for longer aging periods a water suspension of the wettable powder gave higher mortalities. The most erratic results were obtained from water extension of Sevin 45MC. Kill of resistant and non-resistant German cockroaches was definitely lower than that obtained from 2.5 and 5.0% water suspension formulations of Sevin in 1958 (Grayson and Messersmith, 1959).

Very low mortalities at all aging intervals were obtained from water-extended formulations of 1.0% Dimethoate and 1.0% American Cyanamid 18,706, and from Hercules 5727 as a 0.5% emulsion.

Summary

The residual effectiveness of 12 formulations of 7 insecticides, applied to tempered "Masonite" panels, in killing female German cockroaches from resistant and non-resistant strains was determined. The panels were dipped in the insecticidal formulations and the deposits allowed to age for periods of 2, 7, 15, 30, and 60 days before placing the cockroaches on them. Mortality counts were made at the end of 1- and 3-day periods of exposure to the treated panels.

Oil base formulations of 0.5% Diazinon, 1.0% Dibrom, and 1.0% Dimethoate gave complete kill of resistant and non-resistant cockroaches after three days of exposure to deposits which had aged for periods up to 60 days. Good to excellent kill was obtained from a 0.5% oil base formulation of Dibrom, a formulation of 0.5% DDVP plus 2.0% Aroclor 5460, and a 1.0% emulsion of Hercules 5727 after three days of exposure to deposits which had aged for 30 to 60 days. Erratic results were obtained from the 2.0% formulations of Sevin with most mortalities being lower than desired. An oil base formulation of Sevin gave higher mortalities at aging intervals up to 15 days, but

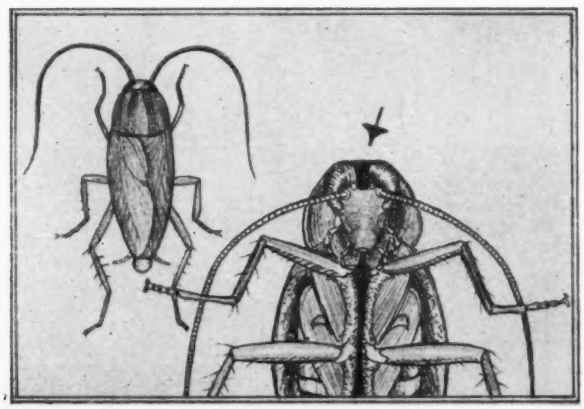
(Continued on page 58)

The Cockroach Twins

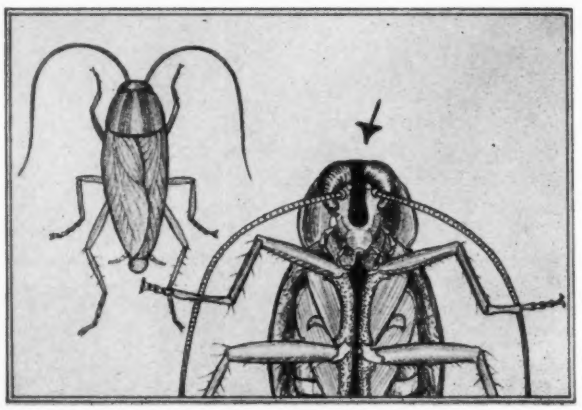
By

MICHAEL T. PALERMO

Entomologist, District Public Works Office, Eleventh Naval District, San Diego, California



GERMAN COCKROACH



FIELD COCKROACH

The German cockroach (*Blattella germanica* Linn.) and the field roach (*Blattella vaga* Hebard) are so similar in appearance that many experienced pest control operators cannot tell them apart. One of the main and most pronounced differences between the two species is the black line between the eyes to the mouth parts in the field roach against the absence of this line in the German roach. (See illustration)

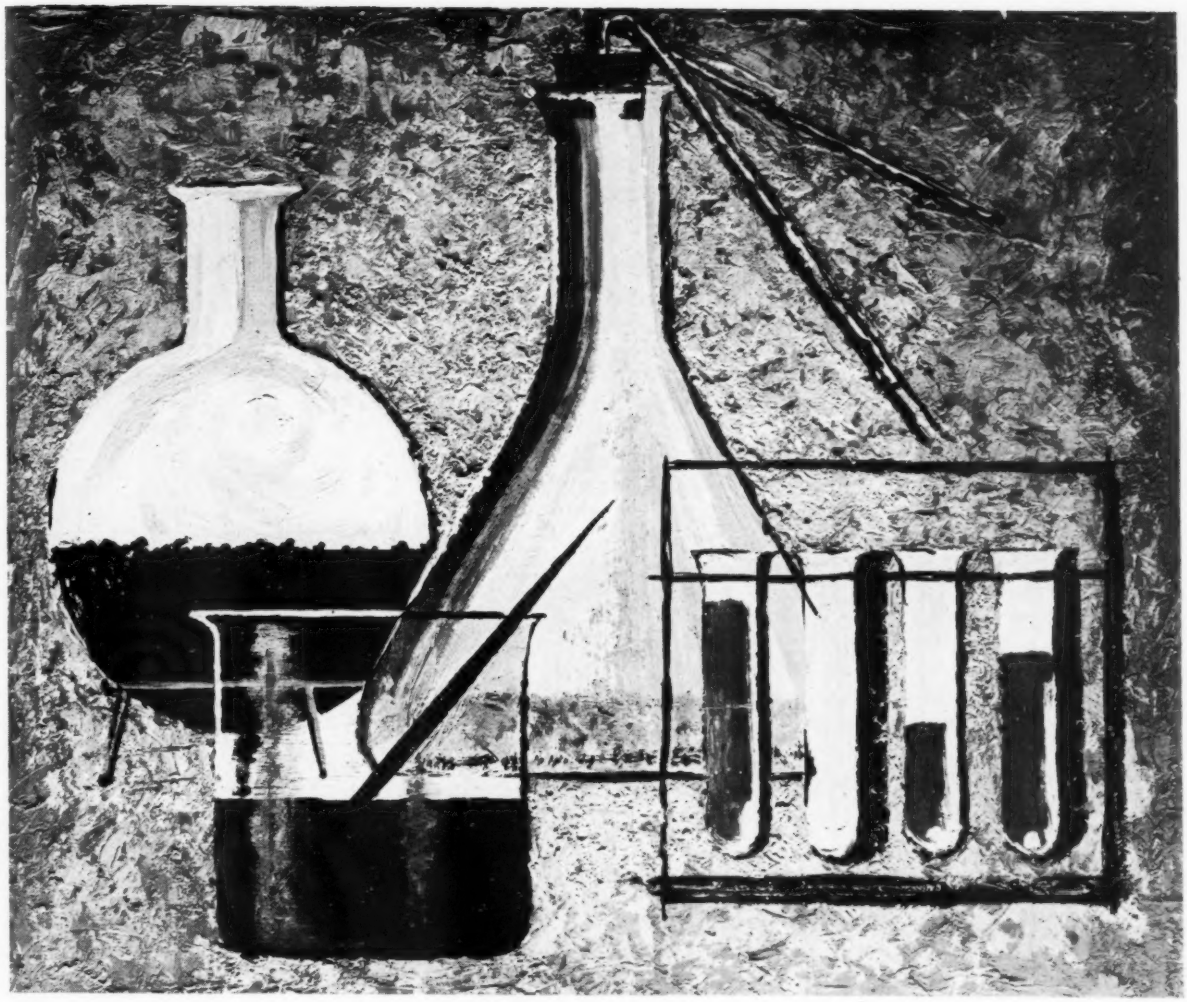
In the southwestern part of the United States, the field roach is gradually increasing in number, and is often found in the home especially during the dry summer months.

German Cockroach (*Blattella germanica* Linn.)	**Field Cockroach** (*Blattella vaga* Hebard)
DESCRIPTION	
Small, about 5/8 inch or shorter, olivaceous in color. Pronotum with 2 longitudinal black bars. Median are of the front (between the eyes) to mouth parts *without* blackish brown line.	Small, about 5/8 inch or shorter, more olivaceous in color. Pronotum with 2 longitudinal black bars. Median area of the front (between the eyes) to mouth parts *with* blackish brown line.
FOOD	
General feeders, fond of foodstuffs favored by man.	Feeds largely on decomposing vegetation.
HABITAT	
Prefer warm moist areas in kitchens and pantries where they hide in cracks and crevices during the day and emerge at night in search of food.	Found under rocks, outdoor flower boxes, lawns and similar areas where moisture is high. It may be found in the home during the summer months seeking moisture.
CONTROL	
Eliminate all food scraps, keep food in tightly closed containers and maintain sanitary measures where food is prepared, served or stored. For elimination and prevention of infestations treat all hiding places and runways with 3.0% malathion or 0.5% diazinon.	Remove decomposing plant material from around the home. Spray foundation area, edges of lawn, outdoor flower boxes and similar areas where moisture collects with a water base spray containing 3.0% malathion or 0.5% diazinon.

REFERENCES

Mallis, Arnold - 1954. Handbook of Pest Control MacNair-Dorland Co.

Flock, R. A. 1941. The Field Roach, **Blatella vaga.** Journal of Economic Entomology 34:121.



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Laboratory Evaluation of Cockroach Repellents

By G. S. BURDEN and J. L. EASTIN
Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture

WITH the increasing resistance of the German cockroach (*Blattella germanica* (L.)) to insecticides it has become necessary to find other means of control. The use of repellents to discourage their movement from one area into another is one approach. A good repellent could be used either alone, or in conjunction with an insecticide as a residual treatment in business establishments or homes. Applications to shipping containers would be particularly helpful in preventing the spread of cockroaches.

LaBrecque and Wilson (1959) recently described laboratory tests at Orlando, Fla., with compounds as repellents against house flies (*Musca domestica* L.). Some of the promising compounds and others were also tested against German cockroaches. Two of the compounds were previously found by Goodhue and Tissol (1952) to be promising cockroach repellents in laboratory tests employing treated cartons.

To evaluate each repellent, 5 ml. of a 2% solution in acetone was applied to the inside of a ½-pint ice-cream carton. After the carton had dried, a hole ¾ inch in diameter was cut in the side to give the cockroaches access to food and water, which were placed inside. The treated carton was set in an enamel dishpan containing 10 male and 10 female cockroaches. The sides of the pan were dusted with pyrophyllite to prevent them from escaping. The cockroaches within the treated carton were counted after 1, 3, and 7 days, and weekly thereafter, until the compound was found to be ineffective. Effectiveness was based on the length of time before more than 50% of the cockroaches were consistently found inside the treated carton. Dead cockroaches were replaced 24 hours prior to each count. Fencholic acid was tested concurrently as a standard, and acetone - treated cartons were used as checks.

As shown in the table, *tert*-butylsulfinyl dimethyldithiocarbamate was the most promising, being effective for 91 days, whereas 2-hydroxyethyl octyl sulfide, perhydro - 4*a*-dibenzofuranmethanol, and the fencholic acid standard were effective for 14 days. Isolan exhibited good repellency, but it also possessed contact or vapor toxicity which hindered evaluation of its repellent action. Although this combination of actions could be of benefit, the high mammalian toxicity of Isolan (the acute oral LD-50 to rats is about 54 mg./kg.) limits its usage.

Additional tests conducted with *tert* - butylsulfinyl dimethyldithiocarbamate indicated this repellent to be effective for 21 and 63 days at concentrations of 0.5% and 1%, respectively.

The following compounds were ineffective as fresh treatments at 2% concentrations:

2 - (1-Aminocyclohexyl) cyclohexanone

3-Chloropropyl octyl sulfoxide

tert - Dodecyl 2-*(*2(2-hydroxyethoxy) ethoxy*)* ethyl sulfoxide

2-Hydroxyethyl octyl sulfoxide

5 - (3-Methyl-1-phenylpyrazolyl) dimethylcarbamate (Pyrolan)

N-Methylsulfinyldibutylamine

Repellency of 11 compounds to German cockroaches.*

*** 2 replications unless otherwise indicated.**

Compound	Percent of cockroaches inside cartons on indicated days							
	1	3	7	14	21	28	63	91
tert-Butylsulfinyl dimethyldithiocarbamate	0	0	0	15	0	15	23	38[1]
2-Hydroxyethyl octyl sulfide	0	3	3	0	93	93	..	..
Perhydro-4*a*-dibenzofuran-methanol	22	23	13	47	77	83	..	..
5-(1-Isopropyl-3-methylpyrazolyl) dimethylcarbamate (Isolan)	15	13	13	13	28[2]	..	..	..
Octyl propyl sulfoxide	0	0	0	88	100	..	..	..
Di-*n*-butylsuccinate (Tabatrex[3])	30	13	50	82	100	..	..	..
Butadiene-furfural copolymer	7	33	70	83	..	..	..	..
2-Hydroxypropyl octyl sulfide	0	15	78	100	..	..	..	..
Chrysanthemumic acid	32	80	85	..	..	..	..	..
Deodorized kerosene	45	93	100	..	..	..	..	..
Fencholic acid (standard)[4]	13	19	49	48	83	90	..	..
Acetone check[4]	98	97	98	95	93	95	93	100

1. 53% and 50% after 98 and 105 days, respectively.
2. Terminated owing to high mortality caused by the compound.
3. Oil formulation, 3 replications.
4. 10 replications.

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Effects of Geographical Location on Infestations by Grain-Damaging Insects[1]

By JOHN R. PEDERSEN
Instructor and Assistant Entomologist
Kansas State College, Manhattan

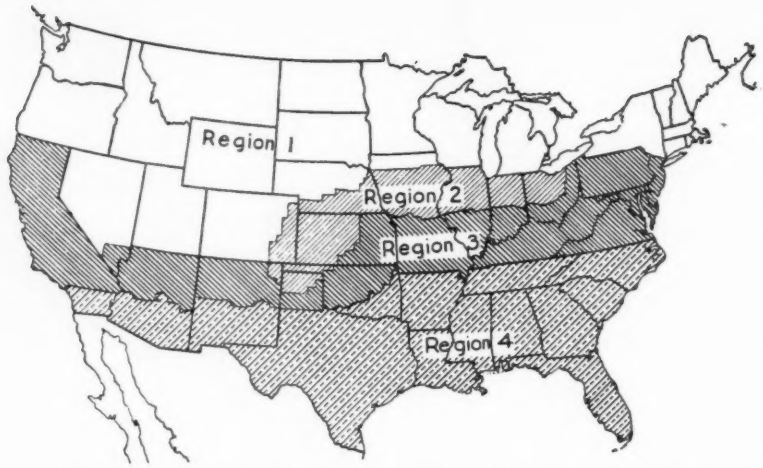

Figure 1. Regional map of the United States indicating relative hazards to farm-stored grain from insect attack: Region 1, little if any insect damage occurs to wheat stored on the farm during the first season; region 2, insects are troublesome during the first season in some years—frequent inspection and occasional fumigation are necessary; region 3, insects are troublesome every year—frequent inspection and fumigation are necessary; region 4, insect control difficult—special precautions are required if grain is to be stored safely.

GEOGRAPHICAL location as a factor in determining infestations can probably best be introduced by a brief look at the origin of stored-grain insects and by a review of factors that influence insect abundance and distribution.

Linsley (1944) indicated a classification of natural sources of stored-product insects, including many of the grain-infesting insects. Angoumois grain moths, granary weevils and rice weevils are listed as being seed-infesting insects. Indian meal moths and Mediterranean flour moths probably were scavengers on dead plant material. The grain infesting dermestids were scavengers on dead animal material just as our present non-grain-infesting dermestids. Various dermestids were also scavengers in the nests of other insects. The cadelles, flat grain beetles, confused and red flour beetles were scavengers living under the bark of trees. Wood borers included the lesser grain borer. A glance at this classification shows that they all originated from environments much like that of stored grain, i.e. generally very dry. Storage of small quantities of seed, roots, etc., as food reserves in ancient times may have been the precursor of our present day stored grain infestation problems. Whatever the origin, it is obvious that through commerce and other avenues, stored-product insects have become world wide in distribution.

Temperature Most Important

Probably the most important factor influencing insect abundance and distribution is temperature. In general, stored grain insects are restricted to a narrow band of temperatures for their development and reproduction. Reproduction is reduced appreciably above 95°F. and below 70°F. Generally they become inactive below 60°F. The duration of warm or cold temperatures also affects abundance and distribution. The relatively short periods of warm weather encountered in the northern United States tend to decrease insect abundance. Relatively longer periods of warm weather in the South tend to increase abundance. It should be pointed out that grain temperatures generally lag behind outside air temperatures with the delay dependent on the bulk of grain.

Humidity Significant

Humidity is another factor which, closely interrelated with temperature, influences the distribution and abundance of insects. Most stored grain insects thrive in an atmosphere where the relative humidity is between 65 and 80%. Khapra beetles, however, seem to be an exception to the rule. They are unable to compete successfully with insects such as the rice weevil and lesser grain borer when the relative humidity is above 50%. Grain with a relatively high moisture content will provide a favorable humidity for stored grain insects within the grain mass. It is also possible that grain mass humidities generally lag behind outside humidities.

Shedd and Cotton (1949) prepared a map (Fig. 1) that divides the United States into four regions, denoting relative hazards to farm stored grain from insect attack. In region 1, which covers most of the northern states, there is little if any grain subject to insect damage. As the regions proceed toward the South, increased hazards to stored grain from insects are evident. Region 4 encompasses the southernmost states where temperatures are warm for extended periods and where humidity, especially in the Atlantic and Gulf Coast states, is high.

An example of how the relative temperatures in different regions affect insect infestation was given by Cotton, et al. (1953). Between July and November 1943, 86-89% of grain bins inspected at Hutchinson, Kansas were infested. At Jamestown, North Dakota, infestation was only 2-3% for the same period.

Certain sections of the United States have a greater abundance of one stored grain insect than another. Atlantic and Gulf Coast states, for example, have two of

1. Contribution No. 724, Department of Entomology, Kansas Agricultural Experiment Station, Manhattan.

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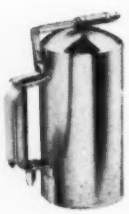

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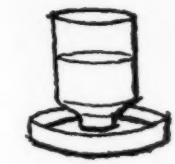
the most destructive species in abundance. They are the rice weevil and the Angoumois grain moth, which are found infesting grain in the field as well as in storage. Illinois, Iowa, Nebraska, Minnesota, and South Dakota form the commercial corn area. Insects most abundant are the saw-toothed grain beetles, flat grain beetles, and red flour beetles. In certain years, when climatic conditions are favorable, the Angoumois grain moth is also a serious pest in the southern part of this section. If the Great Plains section is divided into northern and southern areas, saw-toothed grain beetles and flat grain beetles will be found most abundant in the northern area and rice weevils and lesser grain borers in the southern area. Granary weevils are most commonly found in the northern States.

An interesting example of how temperature and humidity may affect insect distribution was pointed out by Howe and Lindgren (1957). A few years ago southwestern United States was subjected to a severe outbreak of Khapra beetle. This very serious pest was the subject of an extensive search. In attempting to determine the areas to which this insect might spread, Howe and Lindgren made use of laboratory data pertaining to the insect's behavior at various temperatures and humidities, plus climatic data compiled by the U. S. Weather Bureau.

As far as temperature was concerned, most of the southern half of the United States seemed suitable for the development of the Khapra beetle. However, when humidity was taken into consideration, only portions of California, Arizona and Texas were considered to be in danger of rapid multiplication of the insect. Nevada, New Mexico, Oklahoma and Kansas have areas in which the insect could also increase considerably. It should be pointed out that these predictions were made with limited climatic data and that storage environments independent of outside temperatures and humidity could support development.

To discuss the distribution of insects over the world would be a sizeable task. Shellenberger (1958) conducted a study on the quality of wheat import in Northern Europe. In his study he listed the species of insects most frequently found in wheat exported



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from different areas of the world. The following list gives a brief idea of the species present in other parts of the world: South American—rice weevil and lesser grain borer; France — granary weevil and flat grain beetle; Russia—rice weevil and saw-toothed grain beetle; United States—rice weevil and saw-toothed grain beetle; Mediterranean — rice weevil, lesser grain borer, and saw-toothed grain beetle.

It is important to remember that geographical distribution of grain damaging insects is greatly dependent on climate. In general, cool or dry climates do not support large infestations of insects whereas warm and moist climates provide the greatest hazard to stored grain.

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Tools of Preventive Medicine: Insecticides and Germicides. Reprint No. 277. 1959. 6p. Communicable Disease Center, Technical Development Laboratories, P.O. Box 769, Savannah, Ga.

Hand Sprayers and Dusters. 1959 12p.il. Catalog No. A 1.77:63 Superintendent of Documents, Government Printing Office, Washington 25, D.C. 10c.

Toxicological Studies of 0,0-Dimethyl - 2, 2-Dichlorovinyl Phosphate (DDVP) in Tobacco Warehouses. Reprint No. 278. 1959. 8p. Communicable Disease Center, Technical Development Laboratories, P.O. Box 769, Savannah, Ga.

Radioactive Taggings of Culex Quinquefasciatus (SAY) with P^{32}. Reprint No. 281. 1959. 5p. Communicable Disease Center, Technical Development Laboratories, P. O. Box 769, Savannah, Ga.

A Mechanical Device for Separating the Development Stages, Sexes and Species of Mosquitoes. Reprint No. 282. 1959. 4p. Communicable Disease Center, Technical Development Laboratories, P.O. Box 769, Savannah, Ga.

The Regulation of Flow Through Residual Spray Nozzles. 1. Metering Orifices in Polyethylene Discs. Reprint No. 272. 1959. 4p. Communicable Disease Center, Technical Development Laboratories, P.O. Box 769, Savannah, Ga.

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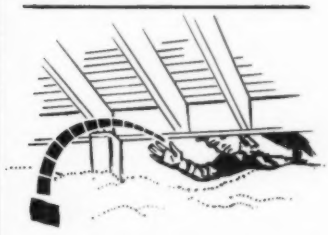

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Diseases Carried by Food Service Cockroaches

By CHARLES MASTERS

"Both flies and cockroaches are outstanding among the omnivorous insects which are of significance in the contamination of food and water as a result of the intimacy and constancy of their association with both the food and the excreta of man and animals." This 1954 statement from Dr. R. B. Eads of the Texas State Department of Health succinctly emphasizes why government public health men are particularly concerned with roach control.

Sanitarian Charles Masters has long been vitally interested in the pest control aspects of municipal health and sanitation. His extensive studies of the literature on disease transmission by insects and rodents were recently supplemented with the latest information when he attended the Communicable Disease Center's extensive and practical course on Insect Control. His article forcefully re-emphasizes the need for cockroach control in food-handling establishments.

Most authoritative reference on roaches is a 147-page Smithsonian publication entitled "The Medical and Veterinary Importance of Cockroaches," published in 1957 by Louis M. Roth and Edwin R. Willis. It is available for $1.25 from the Publications Distribution Section, Smithsonian Institution, Washington 25, D. C. Ask for Smith. Misc. Coll. 134, No. 10. Much of the information here is based upon this publication.

THE PRESENCE of an occasional domestic fly in a restaurant may be excusable because, it seems, in spite of every precaution, these insect pests do get in. However, cockroaches are never to be tolerated. The presence of these pests in food-service operations means not only that something is wrong with management but that there is possible danger ahead for patrons. Man, in his struggle to exist, has learned to shun the places where cockroaches thrive.

Obviously, the presence of roaches causes an economic loss to the restaurant operator because of a decline in his business as well as a decrease in the value of his stored products. These insects not only eat some of the stored food, but that which is not eaten becomes almost worthless because of its typical "roachy" odor. The real danger, however, lies in the fact that very often the food is contaminated with the causative organisms of many of the most serious human diseases.

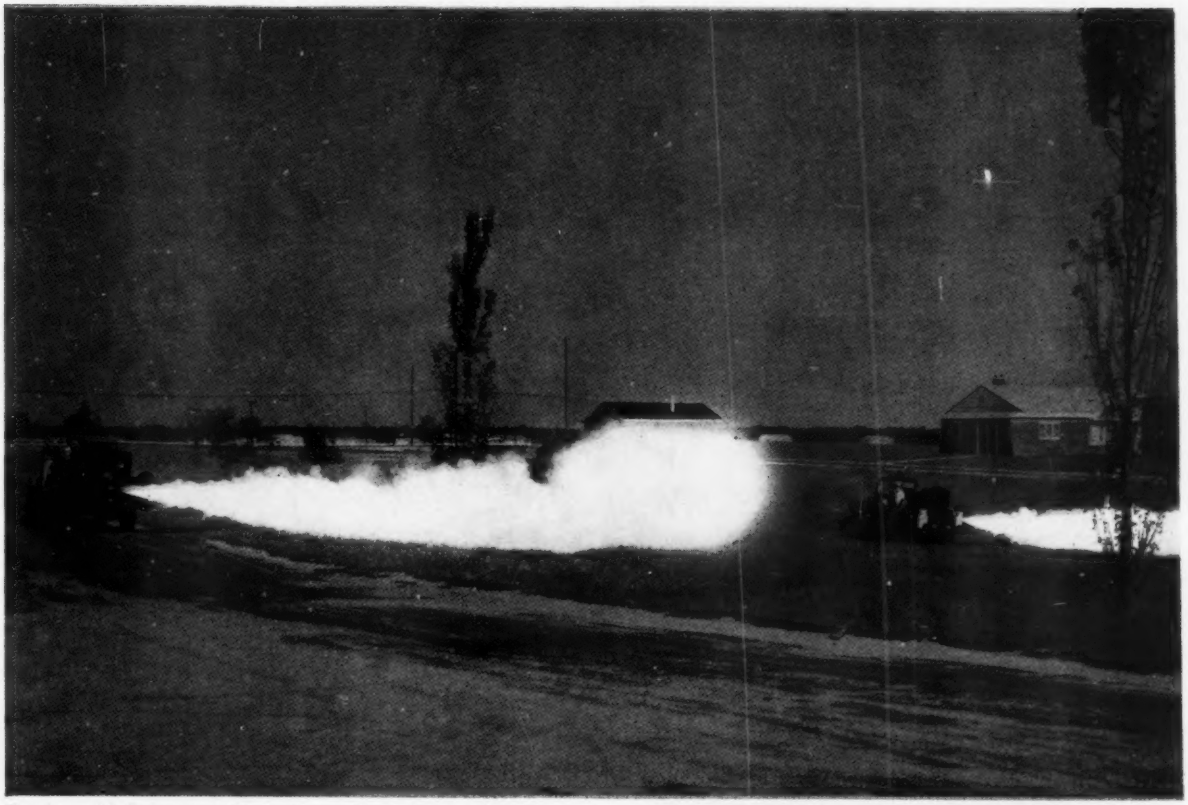
Multiple Sources of Infection

Cockroaches feed on all sorts of materials in sewers, garbage containers, toilets, as well as on food in open storage. They move from individual to individual, sick or well, room to room in houses, family to family in apartments, homes to restaurants, restaurants to homes, and even from city to city. They have every opportunity to transfer infectious materials from place to place and person to person. Thus, they are decidedly one of our most serious public health problems.

Several workers in the field of public health have concluded that cockroaches which have access to toilets where the cysts of *Endamoeba histolytica* are present, may well be capable of contaminating food with their infected droppings and thus act as passive transmitting agents of this organism which causes amoebic dysentery.

It has been demonstrated that *Eberthella typhosa* (typhoid fever) and *Vibrio comma* (cholera) can be carried to man in this manner or on their feet. The causative organisms of salmonellosis and shigellosis can be transferred from contaminated materials to food by these insects. Fortunately, proper refrigeration and sufficient cooking prior to human consumption does much to curb the explosive growth of these organisms.

Cockroaches have been found naturally infected with the organisms of poliomyelitis and may harbor the plague bacillus, *Pasteurella pestis*. The Westbrook type of diphtheria bacillus has been cultured from the feces of cockroaches. The virus of lymphocytic choriomeningitis, or one very much similar to it, has been isolated from the German cock-



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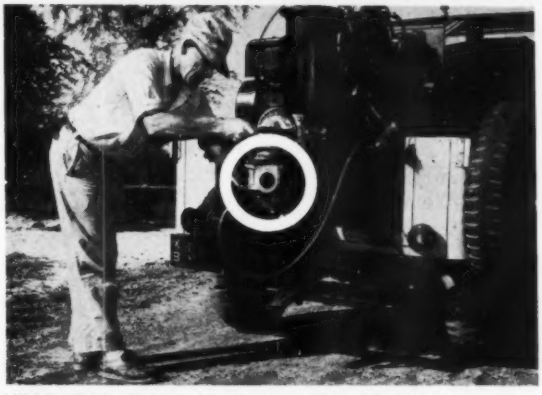

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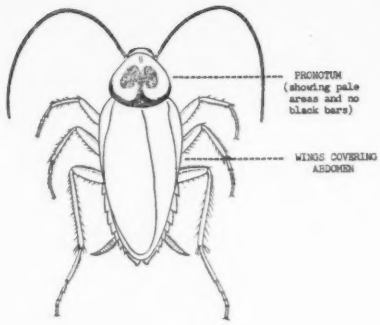
roach. Workers have found that the bacterium, *Bacillus anthracis*, which causes anthrax, actually passes through the intestines of the Oriental cockroach.

There are six protozoa which are very commonly found in the intestines of cockroaches. One of these, *Nyctotherus ovalis*, is very much similar to *N. faba*, which is recorded as a human intestinal parasite whose medical significance is not too well known.

From the secretions of the nose and throat of infected individuals, cockroaches are able to pick up and transmit the organisms of scarlet fever, streptococcal sore throat, measles, and even tuberculosis.

As horrible as it may sound, cockroaches, or parts of them, have been eaten along with particles of uncooked food such as cold cereals and dried fruits. In this way, parasitic worms are established in humans. *Hymenolepis diminuta*, a rodent tapeworm, is very common in rats and mice all over America. It sometimes reaches a length of from ten inches to two feet and is occasionally one sixth inch in diameter. During its development, the worm requires another host besides a rodent. This is usually one of the grain insects and occasionally the cockroach. When the entire cockroach, or certain parts of it is eaten, the worms develop in the human body. Cockroaches become infected by the eating of the droppings of infected rodents.

Moniliformis moniliformis, the common spiny-headed worm of rats, occasionally shows up in humans. It varies in length from two to ten inches, looks like a tapeworm, but has thorn-like hooks on its "head-end." Cockroaches eat the droppings of infected rats and serve as intermediate hosts. When the insects are



accidentally swallowed on food, the worms develop in the human body.

Gonglyonema sp. is a very slender worm which sometimes, but rarely, infests the walls of the esophagus or mouth cavity of humans. They sometimes reach a length of six inches and are usually found in animals but human infection can, and does, sometimes occur after the accidental eating of cockroaches. The embryos of these worms are found in these insects and later develop in the human body.

Of course, just how serious cockroaches might be in any particular location depends very much on many factors such as the proximity of privies, the structure of buildings, and others. However, one of the more important factors is the habits of the species present. For example: some species usually crawl about sewerage systems, others often are found in wooded areas close to buildings, others in pop cases or in open bags of vegetables such as onions and potatoes, others in out-houses, whereas some are generally found in basements or under wet ice boxes. Although these various species usually confine their activities close to the habitats as mentioned above, sooner or later they come in direct contact with man and his food.

COMMON NAME	SCIENTIFIC NAME	DISTRIBUTION	HABITAT
American Cockroach	*Periplaneta americana*	Wide-spread	Sewers, Yards, Streets
Smoky Brown Cockroach	*Periplaneta fuliginosa*	Ohio - South	Greenhouses, Woods.
German Cockroach	*Blattella germanica*	Wide-spread	Pop Cases, Bags of Food.
Brown-banded Cockroach	*Supella supellectilium*	Wide-spread	Everywhere Indoors.
Oriental Cockroach	*Blatta orientalis*	Wide-spread	Damp Basements and Sewer Lines.

Five "Restaurant" Roaches

The five species, as given, are the ones usually seen in or about restaurants. On rare occasions other species might be seen. The common ones can usually be identified as follows:

If less than three quarters of an inch in length, and with two longitudinal black bars which are conspicuous on the pronotum,
—German Cockroach.

without the two conspicuous black bars,
—Brown-banded Cockroach.

If greater than three quarters of an inch in length, and wings absent or shorter than the abdomen,
—Oriental Cockroach.

wings covering abdomen and pronotum having a solid dark color,
—Smoky Brown Cockroach.

wings covering abdomen but pronotum with some pale areas,
—American Cockroach.

Best Controls

The best method of controlling cockroaches in restaurants is by using good sanitary food-service practices. Make all stored food hard to get at. Keep all incoming items such as pop cases and bags of vegetables in a separate room if at all possible, and off the floor in the open. Garbage should be kept in closed containers. Floors and walls should be easy to clean and cleaned often, and free of cracks where food can lodge. Leaky pipes should be repaired. Dark, warm, hiding places should be eliminated if possible. Coffee urns and dish-washing machines should be kept clean at all times. The same applies to meat-slicers and other pieces of equipment.

If cockroaches have already been brought into the restaurant and have established themselves, solid streams of insecticidal solutions or emulsions should be squirted into cracks and crevices in walls and fixtures. Careful attention must be paid to basements and any seldom-used back rooms especially around pipes and plumbing fixtures. Be sure to cover all foods while applying the insecticide. Chlordane (2.5%), dieldrin (0.5%), diazinon (0.5%), lindane (1%), or korlan (2%) are usually quite effective. Treatments should be repeated at intervals in order to prevent the re-establishment of the cockroach.

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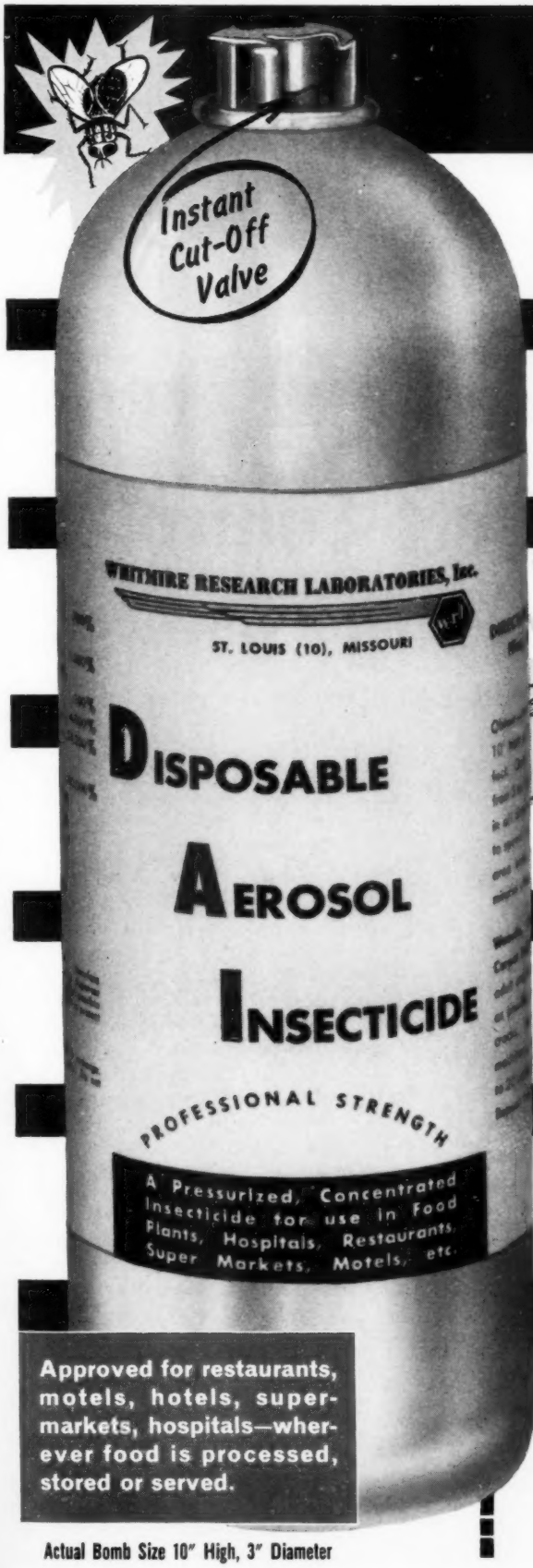

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Shrub and Tree Insect Control

for Pest Control Operators

By DR. DONALD L. SCHUDER, Department of Entomology, Purdue University

THE CONTROL of insects on ornamental plants around the offices and yards of their customers offers PCOs and their firms an additional source of customer service and income. Several insect pests with which the PCO is already concerned, for example —the boxelder bug, elm leaf beetle and the hackberry psyllid are ornamental and shade tree pests which invade homes. Their control on the host plant is usually much easier than after they have invaded the customer's home. Once the PCO has trained his servicemen to control these pests, the next step is a service to control all ornamental pests.

New Skills Needed

There are several problems which the PCO should recognize before he enters into this new field of insect control:

1. The PCO and his servicemen must learn to identify an entirely new group of insect pests. Insect pests of ornamentals have different life histories than those with which the PCO is commonly familiar.

2. Ornamental plants must be learned so that they can be recognized. Many insect pests are host specific—if the PCO knows the host plant, he will be able to identify the insect more easily. In addition, a few ornamental plants are sensitive to certain of the new insecticides such as DDT and malathion. In order to avoid plant injury, the PCO should know at sight such plants as Cannaert juniper, Amur river privet, etc.

3. Most of the insecticides which are used on ornamental plants, such as DDT and malathion, are old acquaintances of the PCO, but the formulations used on ornamentals are different. Where the PCO usually states his spray dilutions in percentages, the nurseryman or arborist usually prefers his recommendations as so many pounds of a wettable powder or so many quarts of an emulsifiable concentrate per 100 gallons of water.

4. The small one and two gallon sprayers commonly used by the PCO serviceman will be satisfactory only for small shrubs. Adequate spraying of large trees and shrubs necessitates high pressure, high volume, power sprayers.

5. Ornamental insect pests can frequently be controlled only at specific times during their life cycle. It is usually not possible to go into the customer's yard whenever the serviceman happens to be in the area and spray for scale insects, borers, etc. and expect to do a satisfactory job.

6. Repeated sprayings throughout the growing season are often necessary to control the insect and mite pests of some popular ornamentals such as evergreens and roses. On roses, for example, it is necessary to spray or dust at weekly intervals, and after every rain to prevent insect and disease problems.

Ornamental Pests

Some of the common insect pests which the PCO will have to know and control are discussed below.

The bagworm, *Thyridopteryx ephemeraeformis* (Haw.) is a common pest of nearly all evergreen and deciduous plants. Its injury to evergreens is the most severe, since these plants usually die after a single defoliation. Most deciduous trees can withstand repeated defoliations over a period of years. The bagworm overwinters as an egg in the bag or cocoon of the female from the previous season. The young larvae hatch in late May and early June, and live in cases of various shapes formed of silk and debris like leaves, twigs, and earth. Sprays for bagworm control should be applied in early June. The small bagworms are easier to kill and their injury to plants is thus prevented. Spray with 57% malathion emulsifiable concentrate at the rate of two pints per 100 gallons of water, or toxa-

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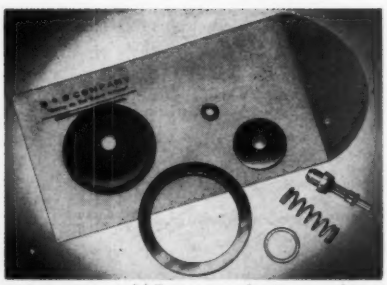

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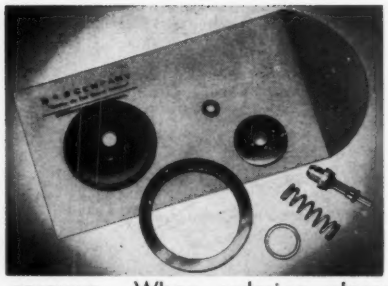

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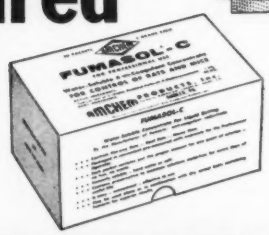

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phene at the rate of three pints of the 60% emulsifiable concentrate per 100 gallons of water.

Mites, or spider mites, are tiny microscopic animals closely related to spiders. Several kinds are serious pests of ornamental trees and shrubs. Evergreens, such as juniper, arbor vitae, and hemlock, are most likely to be injured, but deciduous trees, shrubs and hedges are by no means immune. The three common species of mites are the two-spotted spider mite, *Tetranychus telarius* (L.); the spruce mite, *Oligonychus ununguis* (Jacobi); and the European red mite, *Metatetranychus ulmi* (Koch). Most mites overwinter in the egg stage and can be controlled during the dormant period with oils, lime sulfur or the DN compounds. During the summer months, they can be controlled with any of several commercially available miticides such as Kelthane, chlorobenzilate, Ethion, and malathion.

There are dozens of species of scale insects which attack ornamental trees and shrubs. Every species of tree or shrub is subject to its own species of scale. Scale insects are immobile during most of their life and are protected by a covering of wax.

The close relatives of the scale insects, the mealybugs, remain mobile throughout their life cycle. During 1959, some lecanium scale insects such as the cottony maple scale and Fletcher's scale were more abundant than usual. Scale insects commonly overwinter as eggs and may be controlled during the dormant period with oils, lime-sulfur and the DN compounds. The best results, however, are usually obtained by spraying the newly hatched crawlers in the summer with malathion. Correct timing of the spray is very important.

The elm leaf beetle, *Galerucella xanthomelaena* (Schr.) overwinters as an adult, and frequently becomes a household pest in the fall of the year. The most common host is the Chinese elm, but the elm leaf beetle will also attack American, English, Scotch and Camperdown elms. The insect has two generations with the sluglike larvae skeletonizing the elm foli-

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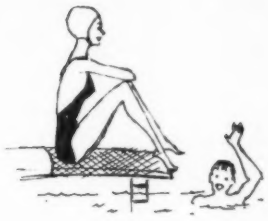

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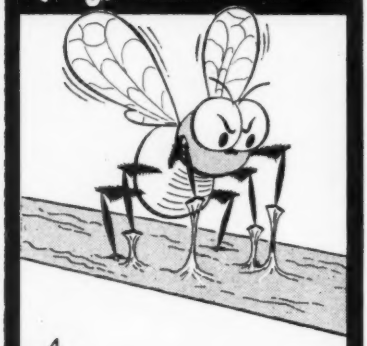

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White pine tree being sprayed for bagworm control.

age in June, late July, and early August. The trees should be sprayed at these times with DDT or lead arsenate to prevent defoliation and reduce the problem of the adults entering homes in the fall.

Boxelder bugs, *Leptocoris trivittatus* (Say), also winter as adults and are a frequent household pest in the fall. The red nymphs and black and red striped adults feed on female boxelder trees. One of the best control measures is to spray the boxelder trees during the summer months before the nymphs mature. Spray the trees with chlordane or dieldrin.

The hackberry psyllid, *Pachypsylla celtidis-mamma* (Flet.), which causes the hackberry nipple gall on the foliage of hackberry trees, also winters as an adult, and becomes a problem in homes. The insect can best be controlled by spraying the trees with lindane or dieldrin at weekly intervals while the leaves are developing in the spring. This prevents the formation of galls on the foliage and subsequent problems associated with adult migration in the fall of the year.

General Purpose Sprays

Frequently a general purpose spray is requested for application to ornamentals. Materials and dilutions usually suggested are listed in Table One. These materials may be combined into one spray or used separately.

A number of new insecticides, miticides and fungicides are currently under investigation and are becoming commercially available. The materials shown in Table Two should make an even more ef-

Table One

Toxicant and Formulation	Amount per 100 gallons	Amount per gallon
25% DDT Emulsion Concentrate	2 quarts	4 teaspoonfuls
57% Malathion Emulsion Concentrate	1 quart	2 teaspoonfuls
15% Aramite Wettable Powder	2 pounds	2 teaspoonfuls
50% Captan Wettable Powder	2 pounds	2 teaspoonfuls

Table Two

Toxicant and Formulation	Amount per 100 gallons	Amount per gallon
50% Sevin Wettable Powder	2 pounds	2 teaspoonfuls
4 lb./gal. Ethion Emulsifiable concentrate	1 quart	2 teaspoonfuls
18.5% Kelthane Wettable Powder	2 pounds	2 teaspoonfuls
65% Cyprex Wettable Powder	1 pound	1 teaspoonful

fective general purpose spray with few problems of phytotoxicity. They may be combined into one spray or used separately for specific pests.

Read and note the following very carefully. Phytotoxicity is a common hazard when insecticides are applied to a wide variety of ornamental plants under a variety of conditions. For this reason, new materials should be applied to ornamentals with caution. Be sure to follow the precautions of the manufacturer as listed on the container.

Plant Tolerances

Some of the plants and their sensitivity to certain insecticides are listed below.

Oil sensitive plants are beech, black walnut, butternut, cryptomeria, mountain ash, Japanese maple, red maple, sugar maple, silver maple, Russian olive, Norway spruce, yews, magnolias, boxwood and other broad-leaved evergreens.

Oil tolerant plants are apple, boxelder, elm, flowering dogwood, linden, rose, burr oak, pin oak, post oak, white oak.

DDT has injured the following plants, particularly when they are near elm trees sprayed with 6 or 12% DDT for the control of Dutch elm disease and/or phloem necrosis vectors: Amur river privet, Scotch elm, English elm, Japanese maple, full moon maple, golden rain tree, hickory, sugar maple, Malus spp., Chinese elm, mountain ash, barberry, fragrant viburnums, elberta peach, Kalanchoe, tulips, crocuses, honeysuckle, bleeding heart, delphiniums and larkspurs.

Benzene hexachloride (BHC) has caused injury to apple and birch trees when they were oversprayed.

Toxaphene has caused injury to linden, oak, sugar maple, imperial gage plum, grape, peach and pear trees.

Malathion has caused severe injury to Cannaert, sargeant's and burk junipers, *Ilex rotunda*, Boston and maiden hair ferns, crassula, violets, African violets, petunias, gloxinias, red carnations, pepper plants and the rose varieties Caledonia and Talisman. In southern areas, injury has been reported on *Philodendron friedrichstahli*, *Pilea cadierei*, Tibouchina, *Feijoa sellowiana*, *Cocculus laurifolia*, *Ficus carica*, *Cassia bicapsularis* and *Euphorbia pulcherrina* var. *alba*.

Parathion has produced noticeable injury on asters, gladiolus, grapes, ferns, forsythia, golden chain tree, African violets, *Ilex rotunda*, rhododendrons and the rose varieties Caledonia and Talisman. In southern areas, papaya, poinsettias, *Pilea cadierei*, Tibouchina, gardenia, *Hibiscus rosasinensis* and *Ficus carica* have been injured.

Ovotran, a miticide, has shown phytotoxicity on azaleas, beech, boxwood, barberry, deutzia, dogwood, *Ilex glabra*, *I. crenata*, *I. bullata*, and *I. opaca*, raspberry, oak, hawthorn, spruce, sycamore and Katsura tree.

Aramite is injurious to pears.

Sulfur and lead arsenate are toxic to viburnums.

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Latest Legislative Action

Affecting the Pest Control Industry

New State legislation pertinent to pest control is continually being proposed or enacted. To keep our readers informed, here is a resume of the latest legislative action. For copies of the complete texts, you may contact state representatives in the states involved.

●

Alaska: House Bill No. 360 (PC May '60, pg. 18) authorizing the Director of the Division of Agriculture to regulate use of agricultural chemicals was **enacted** and became effective March 29, '60, amending the first paragraph of section 33-1-2, ACLA '49.

California: Senate Bill No. 13 to amend the Business and Professions Code, relating to the practice of structural pest control, was approved April 15, 1960 and **becomes effective August 1, 1960.**

Section 8590 is amended to read: All licenses (operators' and field representatives'), and principal and branch office registrations expire on June 30th of each year, and a fee shall be paid for their renewal. License expiration notifications will be mailed on or before June 1st. License holders who do not pay renewal fees within 29 days are penalized.

Section 8610 is amended to read: Each licensed operator, except operators in the employ of another operator, must have a definite place of business to serve as his office for transaction of business, which shall be known as his "principal office." Commencing August 1, 1960 no operator shall engage in structural pest control in his own behalf without registration of his principal office, and payment of its fee.

Section 8613 is added, and reads: Changes in location of principal office or any branch office shall be reported in writing to the registrar within 30 days after such change.

Section 8634 is repealed.

Section 8674 is amended to read: Fees are as follows: Duplicate license $2; Change of name $2; and minima and maxima fees respectively for Operator's examination $10, $25; Operator's license or its renewal $25, $50; Principal office registration or its renewal $25, $50; Branch office registration or its renewal $10, $25; Field representative's examination, or license, or license renewal $5, $15. Where there is a max. and min., the board, with approval of the Director, sets the fee to be paid.

Georgia: House Bill 687, effective March 17, 1960, and amending Georgia's Economic Poisons Act (PC May '60, pg. 18), adds Section 4 B to the law, saying that where any lot or batch of economic poison is found on analysis to be deficient in any guaranteed component, a penalty of 10% of the purchase price for each 1% shortage, or fraction thereof, shall be assessed against the manufacturer or registrant and shall be collected for the use and benefit of purchasers of the economic poison. Penalties run from a minimum of $10.00 to a maximum equal to the price of the economic poison paid by the purchaser. There are no allowable tolerances or deviations from the guaranteed components, and no penalty waivers.

Kentucky: House Bill No. 441 ("Kentucky Hazardous Substances Labeling Act") became "Law Without Approval" on March 30, 1960, becoming effective the 90th day after adjournment of the Kentucky Legislature. The law regulates labeling of hazardous substances for household use, and prohibits the sale, offer for sale, or distribution for sale in a package or container intended for general home and household use, any of these substances when misbranded. Regulations mention $100 to $500 fines, and imprisonment up to 30 days, or both, upon conviction. Each day of violation is a separate offense.

Massachusetts: The Legislation of Massachusetts has under consideration House Bill No. 3042, introduced by petition of the Mass. Farm Bureau Federation, Inc. on April 12, 1960. The bill regulates labeling, distribution, sale or transportation of pesticides and other economic poisons and devices; provides for registration and examination of such materials; defines adulterated or misbranded pesticides; imposes penalties; etc. The bill is an amendment of the General Laws and will be Chapter 94 B, "Regulation of Pesticides," called the pesticide law.

The bill defines the term pesticide to mean (1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, nematodes, fungi, weeds and other forms of plant or animal life or viruses, except viruses on or in living man or other animals, which the secretary shall declare to be a pest, and (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

"Device" means any instrument or contrivance intended for trapping, destroying, repelling, or mitigating fungi, nematodes, or such other pests as may be designated by the secretary, but not any equipment used for the application of pesticides when sold separately therefrom.

"Fungi" are all non-chlorophyll - bearing thallophytes (all non-chlorophyll-bearing plants of a lower order than mosses and liverworts) like rusts, smuts, mildews, molds, yeasts, and bacteria, except those on or in living man or other animals.

The bill mentions that the term "misbranded" shall apply to any pesticide, if among others, it is an imitation of or is offered for sale under the name of another pesticide; or if the label does not contain a warning or caution statement which may be necessary and if complied with adequate to prevent injury to living man and other vertebrate animals, vegetation, and useful invertebrate animals; or if in the case of an insecticide, nematocide, fungicide or herbicide when used as directed or in accordance with commonly recognized practice it shall be injurious to living man or other vertebrate animals, or vegetation, except weeds, to which it is applied, or to the person applying such pesticide.

Registration fee for the first ten brands is $7.50 per brand, and $2.00 for each additional. In no event shall registration of an article whether or not protested by the commissioner, be construed as a defense for the commission of any offense prohibited by the pesticide law.

Other provisions relate to interplant shipments of pesticides, transportation and use of experimental pesticides, pesticides manufactured according to export specifications, with penalties ranging from $50 to $200 for first-offenders to fines ranging from $200 to $1,000, for repeat-offenses or offenses committed with intent to defraud or mislead, or imprisonment up to 90 days, or both.

Effective date is set for July 1, 1961, except as to devices, for which it becomes effective upon enactment.

Michigan: Senate resolution No. 26 (PC May '60, pg. 18) was adopted April 12, 1960 and **becomes effective 90 days after adjournment of Michigan's Legislature.** The resolution provides for a 3-member Senate committee to study use and effects of insecticides throughout the State.

New York: Assembly Bill No. 1162 (same as Senate Bill No. 855) was approved March 22, 1960, and **becomes effective January 1, 1961.** It relates to adulterated or misbranded pesticides (PC May '60, pg. 18).

South Carolina: By Senate resolution No. 419, effective March 22, 1960, a 9-member committee shall study insecticides and related products to control pests affecting crop yields.

Virginia: House Bill No. 539 was approved March 31, 1960, and **becomes effective the 91st day after adjournment of the Virginia Legislature.** It relates to the use of insecticides, fungicides, and rodenticides. (PC May '60, pg. 18)

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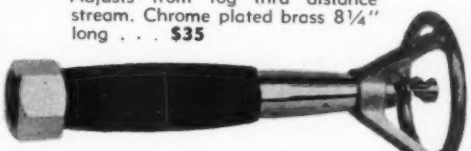

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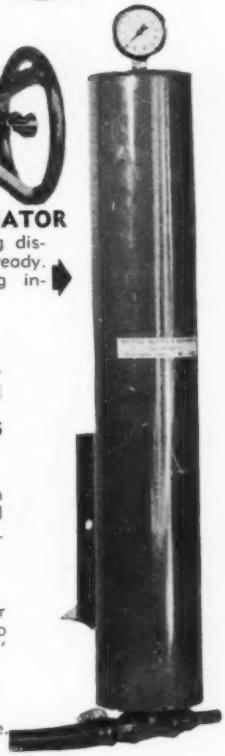

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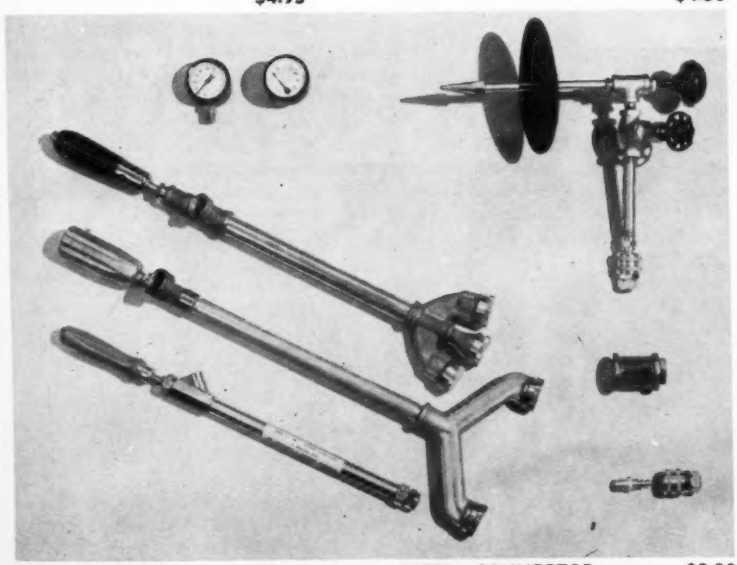

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Serviceman Training and Retention

by H. WILLIAM IVES
Rose Exterminator Co., Detroit, Michigan

Training and retention of employees are two closely related management responsibilities. Training never ends nor does management's efforts to keep good employees.

Both newcomer and old-timer have to learn and keep on learning, as more complex and specialized materials and techniques come into use to meet modern needs of today's pest control. Gone are the days when new servicemen were taken out on a couple of jobs, given a powder bulb and supplies, and then turned loose to service regular customers.

Growth Stresses

Our industry grows, and our men have to keep growing with it. The spread of insects and rodents all over the country, through easy and faster shipping of commodities, is one problem resulting from our nation's growth. And insect habits are changing. Brown banded roaches, formerly found only in the South, are now nationwide pests.

Increased numbers of chemicals add to the complexity of our work. Since World War II, untrained and unguided homeowners can no longer cope with the staggering variety of pesticides.

Resistance has likewise alerted our industry to more specialized techniques and has put a premium on personnel qualified to handle what were once considered "unusual" cases. Restaurants, swamped with flies a few years ago, can't afford to have even a few anymore. The public wants pest-free dinners.

Due to these changing circumstances, fully trained servicemen are seldom readily available, and most of us have to do our own personnel training. It is expensive and time consuming, because it must be well planned to make new men fit into our organizations and make them self-reliant within a reasonable period of time. Since training's primary goal is to get results, trainees should be taught things to do. While pitching in and producing, they will broaden their practical experience and will get filled-in on details and refinements as they go along.

Make sure newcomers are trainable. They should at least have been through high school, although education is not all that counts. But high school graduates are usually able to read and understand training material, instruction pamphlets, and general company communications. Servicemen must learn to keep their knowledge fresh and sharp. In their training work, supervisors should orally give only essentials with maybe an occasional added detail here and there. Written detailed information can be given to complete servicemen's information needs.

Formerly, training was done in costly and inefficient follow-the-leader style. Now, large companies effectively use standardized films, pamphlets, film strips, flannel boards, colored slides, and other visual aids to teach new skills quickly and at lowest cost. But these methods are still too costly for smaller enterprises, which have to rely upon a combination of "classroom" instructions and field training. The NPCA's "Serviceman's Manual" is a helpful textbook for theory and practical applications.

Planned Training Technique

Efficient training and efficient production result from training that has been geared to specific jobs, after each has been defined. They may be defined as either general pest control, termite control, weed control, ornamental pest control, flame proofing, odor control, rat proofing, woodtreating, etc.

Each job is then broken down into its particular functions. General pest control, for instance, could be sub-divided into the following elements:

Service techniques (treatment of stores for rodents, roaches, ants, silverfish, weevils);

Materials (selection and use of most effective and safest insecticides, materials for use in restaurants);

Pest identification (how to differentiate between German and brown-banded roaches, knowledge of the differences in living habits of pests, and the damage they do);

Safety (safe driving and working practices, precautions to take with children and/or pets around);

Company records (their importance and proper use);

Equipment (needed tools, how to keep equipment clean and in good operating condition, emergency repairs on the job, spare parts to carry);

Appearance (dress, frequency of uniform changes, shaving, frequency of truck and car wash);

Customer relations (answers to customer objections, how quickly to answer complaints, how to handle questions the serviceman cannot answer himself).

The important thing is to plan a training program. Before starting out on it, a systematic list of job functions should be made out and kept up-to-date by checking it regularly and making changes as needed. More functions and sub-functions could be listed.

Also train and re-train experienced employees, because yesterday's knowledge is of little value today. Set aside time for some training period, or just a re-hash session, on monthly work schedules. To their surprise, our own veteran employees found out how much and how fast they were forgetting things. Reviews and repetitions are part of any learning process. Keep re-training to keep employees on the ball.

Better training results in better employee retention. Since training is costly in time and money, it's good cost control to retain qualified employees as long as possible. This is true, especially for small businesses. Loss of one skilled worker in a com-

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pany employing 200 represents a ½% turnover ratio, while in a five-man-company it means a turnover of 20%.

Security Basic Retention Element

One important way to keep men is to offer them security. Most working people want it strongly. Job security is the motivating forces of trade-unions and their seniority-rights demands. Social security, unemployment compensation and the automotive industry's guaranteed annual wage offer income security for hourly workers. This lies at the basis of all labor relations.

Let's differentiate, however, between vocational security, job security and position security. The first type of security is derived from general skills which are transferable from place to place within an industry. Job security is similar, but denotes greater specialization, as in the case of termite operators, general pesticide specialists, weed control specialists, etc. The third type, position security, is realized through advancements made within a single company.

These forms of security may vary in importance for each employee. New graduates want jobs with vocational security first, because they plan their careers, and the future of their family, on a specific industry. Position security is not yet important to them, because they can still change from one company to another without loss of position. Later on, when they have spent some time with a company, and have been advanced, position security means more to them.

Ways to Promote Retention

Companies can foster this much-sought-for security in a number of ways. Here again systematic planning pays off. Management should keep a list of their security-promoting factors for their own use. Management's leadership, the opportunities for advancement it provides, its human way of dealing with employees, its consistency in labor relations, and finally its willingness to reward above normal performances, these are all important.

Management's first responsibility is to lead. Employees expect it. Without leadership any company becomes a "headless horse," running without sense of direction, plan or purpose. Loss of leadership usually happens by default, when management gets lost in details or other people's problems, instead of making major decisions for the company. Leadership stimulates employees and marshalls them into a purposeful unit, where spirit runs high, where morale is in top shape, and where the feeling of security is ever present.

Advancement is another means by which management can promote security. It should continuously aim to advance employees. Workers stick to companies where they can climb the corporation ladder. They leave when they see no opportunity for advancement. It's disastrous to make promises of advancement when the company doesn't offer such opportunities.

When employees are treated as human beings, they stay for keeps. Like all of us, they want to be treated as important individuals. Like all of us, they feel that their problems are most important. Lend them a sympathetic ear. Employees like to discuss some of their problems with people they respect. It can be difficult to be a good listener, but it certainly builds confidence, and a feeling of security.

Emerson, the noted American poet, once said that "consistency is the hobgoblin of little minds." This may be true for creative thinking, but not for employee relations. Disregard for company rules is like forgetting the rules in a baseball game — confusion follows. Rules must be observed, but if they are not important enough to be enforced, scrap them.

To make company policies and rules work to everybody's benefit, put them in writing, distribute copies to all employees, have a question period on them, and then enforce them to the letter. This doesn't mean that they should never be changed. Policies should always be upgraded, improved, adapted to new circumstances. Thus employees will see them as a living guarantee of equal treatment; another way to promote security.

Employees like rewards for unusual jobs well done. It makes them feel important both because of their performance, and because of its recognition value. In small businesses, where such attentions are all too often forgotten, outstanding achievements can can be found in length of service, low complaint record, high sales record, safe driving, personal appearance, etc. Cash, pins, watches, certificates, recognition banquets, etc., can serve as typical awards. The significance of employee contributions and performances, as well as budget limitations, determine the size and nature of awards.

Employee support is guaranteed when performance evaluation follows firm and rigid rules, and when awards go impartially to

(Continued on page 57)

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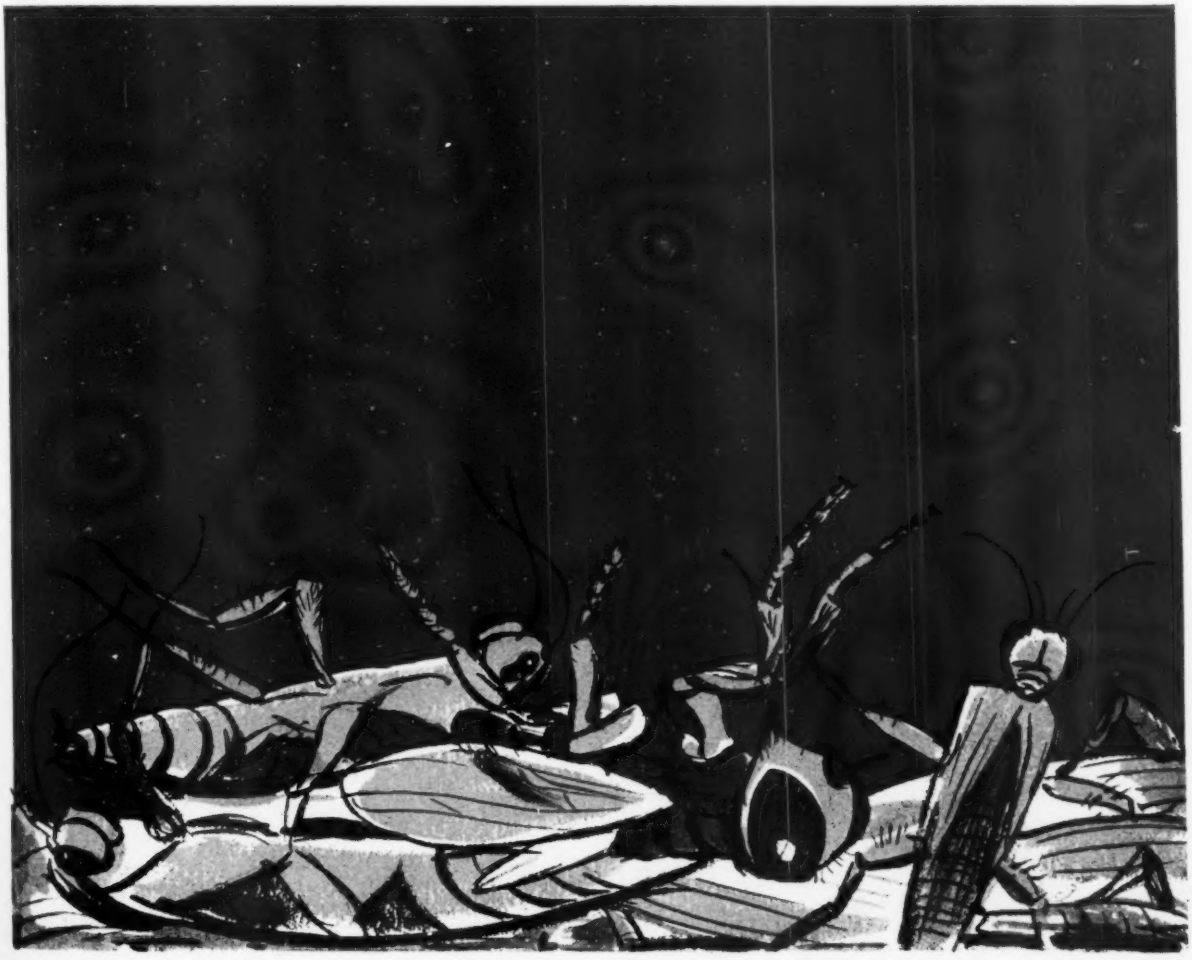

When Writing to Advertisers Please Mention PEST CONTROL

Are fungi beneficial to the termite diet?

Termites and Their Attack on Sound Wood

By ANDERS E. LUND

Koppers Company, Inc., Verona Research Center, Verona, Pennsylvania

A number of studies, beginning in the early part of this century, were directed towards the relationships between termites and fungi. These studies were concerned mainly with the use of fungi or infected wood by termites as a source of nitrogen. Uvarov in 1928 questioned how termites were able to obtain sufficient nitrogen for growth. Cleveland (1925) determined that termite growth was the same regardless of whether wood or filter paper was the food source. Roessler (1932) observed that decayed wood was not as beneficial as a food source as was sound wood. On the other hand, Hendee (1935) reported that wood decayed by fungi yielded better termite growth. In 1941, Hungate, in a study on the nitrogen economy of termites, concluded that *Zootermopsis* did not significantly increase in size, nor did the nitrogen content of the termites increase when they were fed on sound pine wood. Variable results were obtained when decayed pine was utilized as the food source. In a later study Hungate (1944) reported that the supply of nitrogen in wood and in soil is adequate for termite growth but that it is necessary for fungi to act on these nitrogenous materials before significant termite growth can occur.

Relationship Hard to Determine

At the present time the association between subterranean termites and wood-destroying fungi has been designated as being either environmental association or some form of mutualism (symbiosis, etc.). A positive determination of this relationship is a difficult undertaking for it is necessary to sterilize both the interior and exterior of the termites before they can be used as a determinative agent. Surface sterilization has been accomplished in the required degree e.g. by dipping the termites in a 0.1% solution of thimerosal (Merthiolate). Agar plate tests have shown that this dip can effectively control surface Aspergillus contamination of the termites. The problem of intestinal sterilization of the termites without damaging their symbiotic protozoa remains unsolved.

An aseptic test environment can be obtained by using sterilized sand, and distilled water. Wood, found by microscopic examination to be free from fungal infection, can be sterilized and used as the food source. The sterilized component parts can be assembled under sterile conditions and retained in an aseptic environment. Without sterilization of the termite gut however, this procedure can only give a partial answer to the association question.

A first step in this insect-fungi association has been the determination that certain eastern subterranean termites (*Reticulitermes flavipes* Kollar, and *R. virginicus* Banks) are capable of initiating attack on sound southern yellow pine sapwood.

For this test, material was obtained from a pine board (*Pinus* sp.) free from visible defects and excessive resin. Microscopic examinations of selected specimens, carried out at magnifications of up to 970 diameters, revealed

Termite Mortality vs. Time of Exposure to Agar and Fungi

Fungus and Plate No.*	Percent Mortality at Inspection Periods							
	3 days	8 days	11 days	14 days	18 days	27 days	35 days	43 days
Control 1	0	20	20	90	100	—	—	—
Control 2	0	10	20	80	100	—	—	—
534 No. 1	100	—	—	—	—	—	—	—
534 No. 2	100	—	—	—	—	—	—	—
563 No. 1	0	0	0	0	0	40	80	100
563 No. 2	0	0	0	0	20	40	70	70
617 No. 1	0	0	40	40	60	80	100	—
697 No. 1	0	10	10	40	50	90	100	—
697 No. 2	0	0	20	70	90	100	—	—
698 No. 1	10	40	60	90	90	100**	—	—
698 No. 2	80	100	—	—	—	—	—	—

* 534 = *Lentinus lepideus;* 563 = *Poria incrassata;* 617 = *Lenzites trabea;* 697 = *Polyporus versicolor;* 698 = *Poria monticola.*

** 100% mortality at 20 days.

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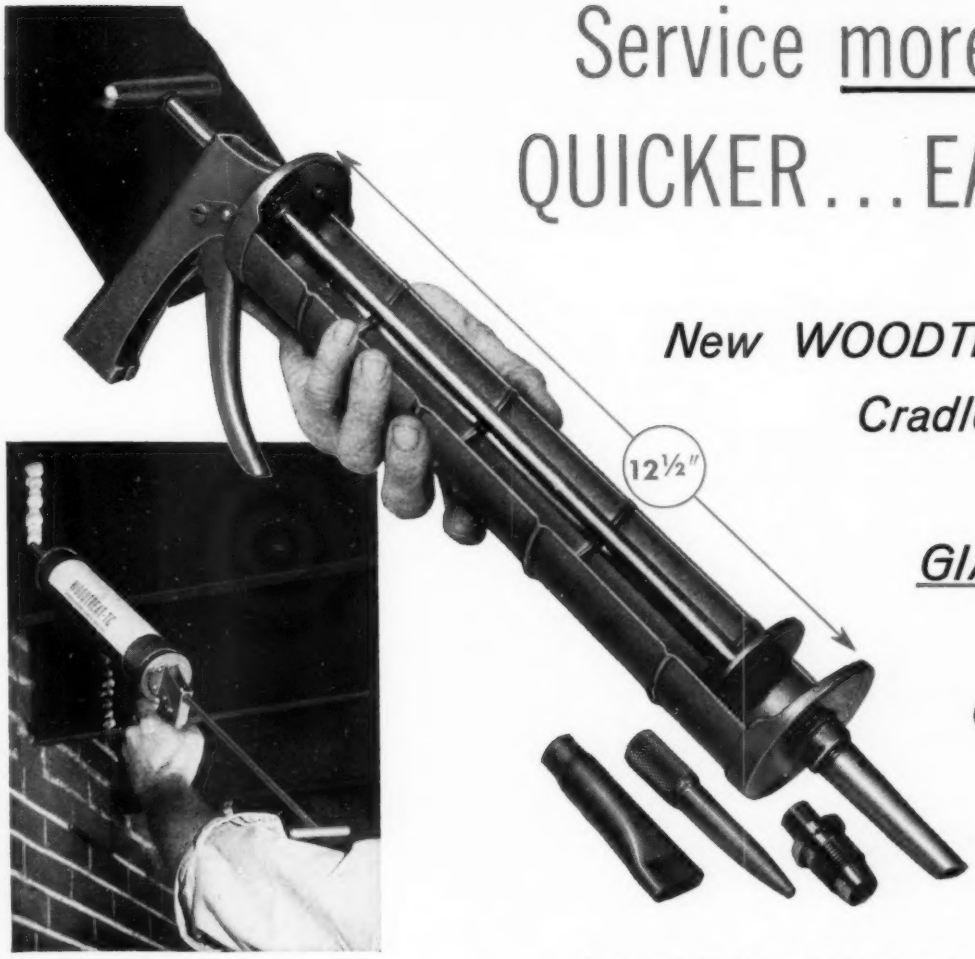

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9/32 - 6	1.33	3.33	3.67
5/16 - 4	1.40	4.00	4.34
5/16 - 6	1.40	4.00	4.34
3/8 - 4	1.53	4.40	4.74
3/8 - 6	1.53	4.40	4.74
7/16 - 4	1.73	4.54	4.87
1/2-1/4 Sk	2.00	4.67	5.00
1/2-3/8 Sk	2.00	4.67	5.00
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that the material was free from visible fungal infection. Test blocks were randomly selected and vacuum impregnated with distilled water. The blocks were placed in aerated one-pint glass jars with sterilized sand moistened with distilled water. Subterranean termites (approximately 150 of the previously mentioned species) were added to each jar. A single block was removed at varying intervals and sterilized. Sectioning of the blocks was followed by microscopic examination to determine the presence of fungal hyphae. The results showed that the wood remained free of infection for the first four days. Thereafter, fungal infection took place and increased in intensity up to the time of removal of the last specimen—after 20 days of exposure to termite attack. From these data it is concluded that certain eastern subterranean termites can attack sound wood that has not been previously infected by fungi. This study did not, however, resolve the question of the necessity for the presence of fungi for the prolonged subsistence of the termites.

Termite Nutritional Needs

Cook and Scott (1933) studied the nutritional requirements of termites and concluded that the requirements were comparable to those of other animals. The food source of the necessary elements was not studied however. It is debatable whether termites are able to derive all the necessary nutrients for their sustenance from a given species of wood or whether they require the presence of fungi (or bacteria) to supply additional assimilates, either by the actual ingestion of fungal hyphae and/or by assimilating substances produced by the fungal or bacterial action on wood. It is generally agreed that, in addition to a carbohydrate source (usually cellulose), termites need amino acids (usually from protein), certain minerals, and vitamins for growth and vigor. Specific requirements for these elements have not been established so a simple deduction based on the compounds in wood would not be valid.

It is not inconceivable, on the other hand, that a number of unidentified wood-destroying fungi might be antagonistic to subterranean termites in a natural environment. Thus, if the termites were to encounter wood infected by an antagonistic fungus, the insects might actually be repelled by the decaying organism and the wood would remain free from termite degradation. There is also the possibility that certain fungi reduce the palatability of wood to a level that precludes termite attack under low insect population levels or the availability of other food sources. In our laboratory some of the common wood-destroying fungi are maintained. Among them are:

Lentinus lepideus Fr.
Lenzites trabea (Pers. ex Fr.) Fr.
Poria monticola Murr.
Polyporus versicolor L. ex Fr.
Poria incrassata (Berk. & Curtis) Burt.

All of the above are brown rots except *Polyporus versicolor* which is a white rot. Those decay fungi which preferentially attack mainly the cellulosic elements of wood and thus leave high residuals of lignin are classified as brown rots; those which generally attack all components are known as white rots. Disregarding certain factors it is evident that wood decayed to an advanced stage by a brown rot will not contain as much carbohydrates as will a similar piece of wood decayed by a white rot to the same weight loss.

Degrees of Compatibility

As a first step in obtaining information on the relationship between specific fungi and *Reticulitermes flavipes* a study was devised using Petri dishes containing Bacto malt agar. Dishes and agar were sterilized and then inoculated with the above named fungi; 2 dishes per organism. When sufficient growth was obtained to cover the agar surface, ten termites were introduced into each plate. Control dishes containing agar only were also employed. The inoculated Petri dishes containing the termites were stored over water in a covered desiccator

(Continued on page 44)

Nutritional Studies on Subterranean Termites*

By JOHN KERR BREADY

Purdue University, Lafayette, Indiana.

Because previous research on termite nutrition has not taken into account the micro-organism factor (fungi, protozoa and bacteria) in the diet of the termite, it is necessary to investigate this subject once again, but this time without the interfering micro-organisms.

When the nutritional requirements of an insect are investigated, a qualitative and quantitative determination is made of those nutrients essential to the well-being of the insect. The nutrients required may fall into the following categories: carbohydrates, fats, proteins, vitamins and minerals. Instead of using a natural diet, a synthetic one is obtained by mixing certain of the above nutrients in certain amounts in a glass container stoppered with a cotton plug.

Sterile, Synthetic Diet

After preparation of the synthetic diet, it is heated to a temperature high enough to kill any micro-organisms which are present in the diet. At this point the diet is sterile, which is very important because: 1) micro-organisms are able to break down nutrients on which they live; 2) micro-organisms are able to form new nutrients; and 3) micro-organisms themselves, when they die, serve as a source of nutrient since they are composed of compounds of nutritional value. If the diet is not sterile, the micro-organisms will be adding and taking away nutrients in the diet of the termite and will of course interfere with the results obtained.

Insect eggs are used to start nutritional studies because the egg shell may be sterilized of micro-organisms by the use of certain chemicals. When the sterilized egg is placed on the synthetic diet and the nymph hatches from the egg, the diet remains uncontaminated by micro-organisms. However, the egg of a termite cannot be used in a nutritional study because the nymphal termite, during its hatching from the egg, is entirely dependent upon older termites in the colony. Older termites, which are contaminated with micro-organisms, make contact with the newly hatching termite, and thereby also contaminate them with bacteria.

It is extremely difficult to sterilize a termite of the micro-organisms that it carries on its body wall and in its intestine. Termites used in previous nutritional studies were not sterilized of their micro-organisms. That is why this new study, now in progress, is attempting to eliminate the interfering micro-organisms.

Three Kinds of Micro-organisms

There are three kinds of micro-organisms that interfere with a termite's diet. First, there are the protozoa that live in the intestine of the termite, but these micro-organisms present no problem since they may be killed by the use of high oxygen tensions. Secondly, there are the fungi carried on the

*Graduate study supported by the Pest Control Industry through the J. J. Davis Research Fund.

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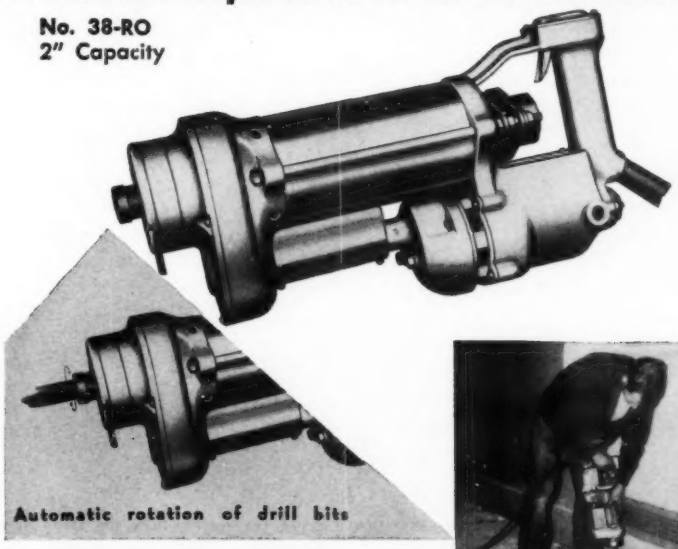

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body wall and in the intestine of the termite. These fungi can be killed, however, by the use of a fungicide in the termite's diet. Finally, there are the bacteria which are also carried on the body wall and in the intestine of the termite.

The bacteria are the micro-organisms that present a problem, and thus far three methods of killing bacteria have been tried. First, high temperature was used, but it was found that the bacteria in the gut of the termite could withstand a higher temperature than the termite could. So this is not a satisfactory method. Another method of killing bacteria is through the use of a germicidal lamp. However, when the termite is put under this lamp, it dies before the bacteria —once again an unsatisfactory method. Still another method of killing bacteria is by using bactericidal chemicals in the termite's diet. The antibiotics used thus far have not proven to be successful, e. g., penicillin, streptomycin, erythromycin and neomycin. The criteria that one must employ in choosing a satisfactory antibiotic, even before it is actually tested to see if it will kill the bacteria, greatly limit the number of antibiotics that may be tested. Many more antibiotics will be tested for use in the diet of the termite, and more avenues of approach to killing bacteria will be investigated.

It may be some time before the questions relating to termite nutrition are answered, but when they are, a better understanding of behavior and feeding habits will be realized.

Termites and Sound Wood

(from page 42)

at 80°F. The plates were removed and inspected at varying intervals to determine insect vigor and mortality. Examinations revealed that both controls exhibited 100% mortality after 18 days. One plate containing *Poria incrassata* exhibited 70% mortality after 43 days; mortality in the other plate was 100%. *Lenzites trabea* plate mortality was 100% after 35 days; for *Polyporus versicolor* 100% mortality was experienced between 27-35 days; for *Poria monticola* mortality was 100% in one dish after 8 days and 100% in the other after 20 days. At the 3-day inspection 100% mortality was noted in both plates containing *Lentinus lepideus*. Using the results from this test it is possible to assign tentative compatibility rating to five common wood-destroying fungi in relationship to *Reticulitermes flavipes* using malt agar as the food source. Listed in order of decreasing compatibility are:

1. *Poria incrassata*
2. *Lenzites trabea*, *Polyporus versicolor*
3. *Poria monticola*
4. *Lentinus lepideus*

It appears that *Poria incrassata* significantly increases the ability of termites to sustain themselves on malt agar while *Lentinus lepideus* has a definite antagonistic influence.

Sufficient data to detail reactions of termites when exposed to combinations of the different decayed woods and sound wood have not, as yet been collected.

The agar-plate test data should not be extrapolated to obtain data on the compatibility of decayed wood and subterranean termites.

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T-Warranty Closer to Reality

The Executive Board of the National Pest Control Association met in St. Louis, Mo., during May to consider the tentative approval given by the New Jersey Insurance Bureau of the NPCA's proposed program to insure participating members' termite pretreatment work. Announcement of details is expected to come within the next six to eight weeks, according to Dr. Ralph E. Heal, executive secretary of the NPCA.

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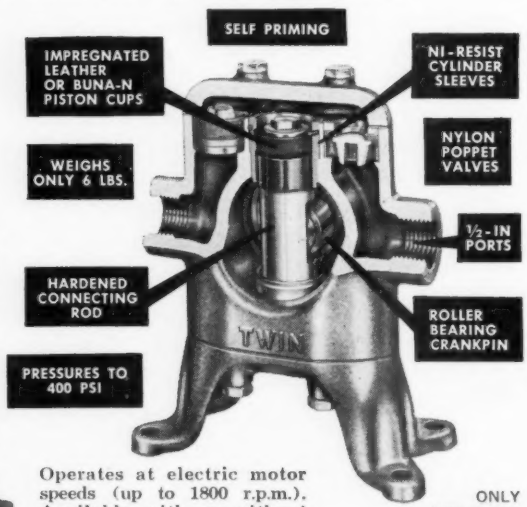

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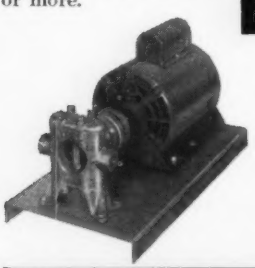

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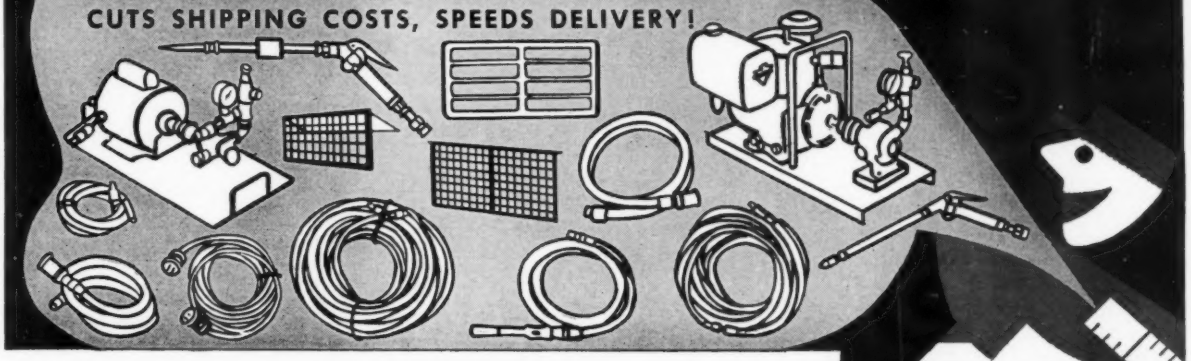

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Registration of Two New Insecticides for "PCO Use" Announced at Chicago CSMA Meeting Last Month

Butonate and DDVP, heretofore known only as promising new insecticides that looked good in the laboratory, have now been registered by the Federal government for use by pest control operators.

Announcement of registration for each chemical came separately during the Chemical Specialties Manufacturers Association 46th Mid-Year Meeting at the Drake Hotel in Chicago, May 16-18. Over 950 registered for the semi-annual convention programmed with concurrent sessions held by its five divisions: aerosol, automotive, detergent and cleaning compounds, waxes and floor finishes, and insecticides.

At a press conference, Prentiss Drug & Chemical Co., New York City, announced it had been assigned exclusive use-rights to the butonate license held by the Wisconsin Alumni Research Foundation. The new organic phosphate insecticide, referred to as a Dipterex derivative, is a development of Dr. J. E. Casida and Dr. B. W. Arthur at the University of Wisconsin's department of entomology. It has undergone four years of test work and research, Prentiss claims.

It was Dr. Ralph L. Tracy of Norda Essential Oil and Chemical Co., Inc., New York City, who told the closing Insecticide Division session that the USDA and the Public Health Service have approved the use of DDVP by PCOs as a spray for control of flies, cockroaches, fleas, and the brown dog tick. It is a volatile, "fumigant type" insecticide that must be applied in percentages per cubic feet, rather than in square feet common to most other PCO chemicals.

Butonate, Prentiss explained, has low mammalian toxicity, residual activity, an inoffensive odor, is non-staining and is soluble in organic solvents. Test work reveals it is effective against German roaches at .8%, a concentration also tentatively recommended for control of carpet beetles, silverfish and other crawling insects. For houseflies, suggested strength is reduced to .4%.

Butonate may be formulated as an oil spray, an emulsion, wettable powder, or dust. Initially, Prentiss will offer butonate formulations as a technical material with 11.5 lbs. per gal.; as a 25% emulsifiable concentrate; an oil soluble concentrate; and a 16% butonate —1.0% piperonyl butoxide—0.4% pyrethrins concentrate.

Label approval is "for experimental use only" by PCOs. Users are cautioned to avoid contamination of feed or foodstuffs intended for human or animal consumption. Livestock to be used for human food must not be treated with butonate.

Prentiss says its butonate will effectively control resistant German cockroaches.

"DDVP is not a true fumigant in the sense of the lighter gases such as HCN or methyl bromide," Dr. Tracy explained. Its molecule is relatively heavy and its fumes have poor penetrating powers into commodities like bulked grains, piles or sacks of spices and other substances, or tobacco packed in hogsheads. DDVP does vaporize rapidly in open air such as in a room.

Since dosages are related to the volume of treated areas, DDVP must be used precisely so that not more than one gram of the chemical is applied in 2,000 cubic feet, unless a greater concentration is specifically required and special precautions or methods are followed.

Usually DDVP sprays are effective for 1 to 5 days after application, but adsorbent materials treated with the organic phosphate may remain insecticidal for 3 to 4 weeks, Dr. Tracy said.

"Such chemical behavior obviously necessitates that PCOs give conscious consideration to vapor adsorption on various objects when DDVP is used in closed areas or in restaurants and homes," he warned.

Insecticidal dosages of DDVP in the laboratory and in the field have "not shown in humans or animals any physical symptoms of poisoning," the Norda executive reported.

"Probably the most promising lead in the search for better methods of mosquito control relates to the potential of DDVP vapor as a residual fumigant against adult mosquitoes," according to Dr. Herbert F. Schoof, Technical Development Laboratories of the Communicable Disease Center in Savannah, Ga., who talked to the CSMA Insecticide Division on recent insecticide developments for control of medically important arthropods.

"Small quantities of this pesticide have produced complete mortalities of exposed mosquitoes even when used in ventilated huts," Dr. Schoof reported.

The CDC is developing an automatic DDVP vaporizer which may be effective for insect control in airplanes to give 95 to 98% elimination of such pests as flies and fleas. Such a technique relegates the dispensing of insecticides to a mechanical process rather than keeping it on the crew-type operation now prevalent in quarantine procedures, the CDC expert explained.

"Aside from fly and mosquito control, the organo-phosphorus pesticides assume a dominant role in arthropod control wherever arthropods have displayed marked resistance to chlorinated hydrocarbon insecticides," Dr. Schoof said. Tests have shown that malathion is highly effective against human body lice without any harmful effects to human beings, according to a CDC experiment run as long as 16 weeks.

Federal pest control researchers are funneling more time into answering resistance problems.

But, regardless of the effectiveness of old and new pesticides, delegates were reminded by Jack Dreesen of the National Agricultural Chemicals Association that they have a new problem to face: growing public resistance to the use of pesticidal chemicals at all because of the misinformed publicity finding its way into consumer publications.

John T. Coyne, of the Pesticide Regulation Section in the U.S. Department of Agriculture, told the group of pesticide manufacturers about Public Law 86-139 enacted

(Continued on page 54)

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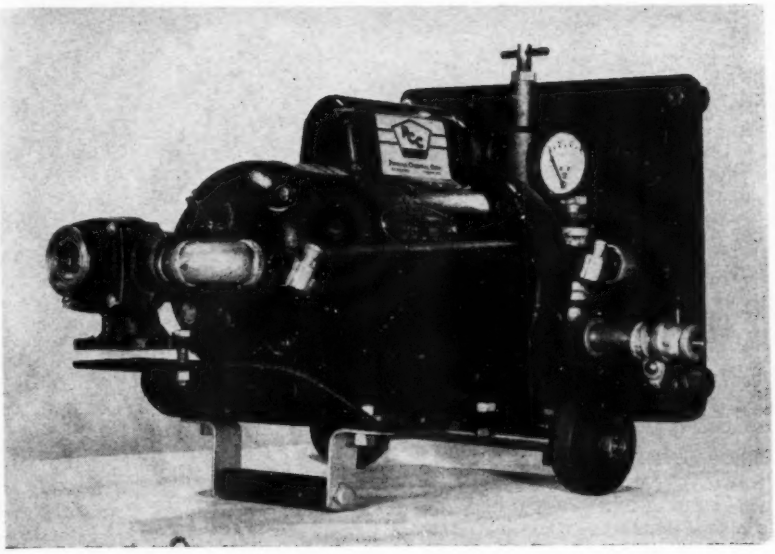

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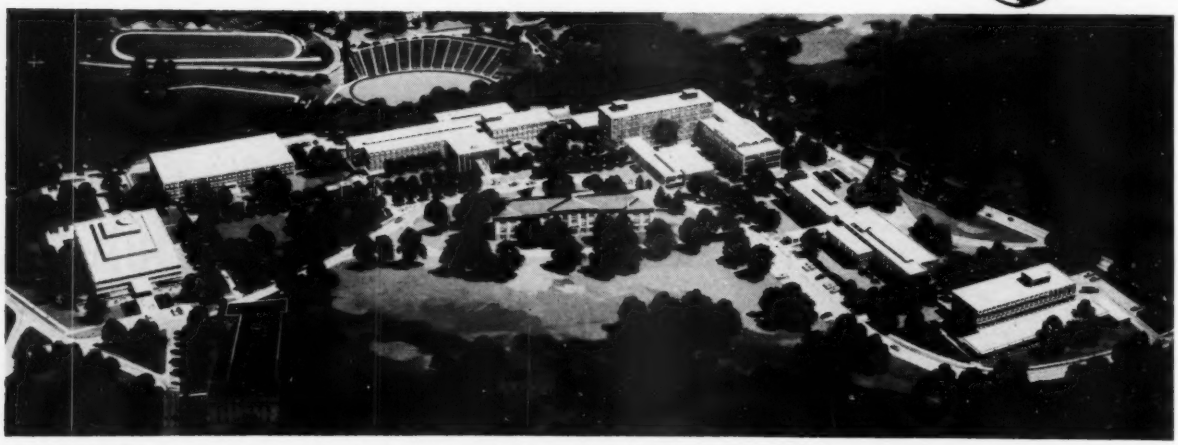
What's NEWS In The Industry



New $12.5 million Science Center of Georgia U, Athens, will house (clockwise) departments of Physics, Mathematics-Geography-Geology, Chemistry, Biology, Livestock-Poultry, and Food Technology. Entomology will occupy part of the Biology Building and have extensive facilities.

Ga. U's Ent. Dept. Moves to $12.5 Million Science Center

This summer the University of Georgia's entomology department will move into the brand new Science Center on the hill overlooking Athens' famed Sanford Football Stadium, Dr. Horace O. Lund, department head, reports.

The $12.5 million Center will be for the departments of Physics, Chemistry, Mathematics, Geography-Geology, Livestock-Poultry, and Food-Technology. Entomology will be housed in the $3.5 million Biological Sciences Building, together with Bacteriology, Botany and Zoology.

Entomology will occupy the entire fourth floor in the teaching and laboratory wing under the roof-greenhouses (middle story of third building counterclockwise in the above picture). It will also have the facilities of three roof-greenhouse units, a major portion of the sixth floor of the faculty office and research wing, and a large storage and garage area.

Research features will include four walk-in variable temperature and humidity rooms, a large climate controlled rearing room, separate climate-controlled insecticide treatment and holding rooms, separate physiology and toxicology laboratories, a darkroom, an insect museum, and laboratories associated with each faculty office.

The 21,000 square feet entomology quarters can accommodate 250 students, while the Center's auditorium can seat 300.

Three staff members, Dr. C. R. Jordan, W. C. Johnson, and R. L. Robertson, are devoted to agricultural extension, and three, Dr. P. E. Hunter, Dr. J. J. Paul, and Dr. Lund, are engaged in teaching and research. To keep pace with growth one, or possibly two members will be added.

Although Georgia U's Ent Department has existed only since 1954 as a separate department, the March '60 issue of the Bulletin of the Entomological Society of America reports it has the fourth largest number of undergraduate majors in the country.

Five More Sates Get NPCA Termite Promotion

Delaware, Illinois, Kansas, New Jersey, and Texas newspapers have now received the series of three termite control publicity releases being sent out by the National Pest Control Association. Last month (PC May '60, pg. 70), the NPCA announced seven other states had been blanketed.

Dr. Dale F. Bray, chairman of the Entomology Department at

Pursuing kingfish instead of landlubber pests, W. B. Gresham, Jr. of Gresham Exterminators, Tampa, Florida, took to the waters of the Gulf of Mexico, together with his employees. Last April 15, half of Gresham Exterminators could boast of their results in the annual kingfish run shown in the picture above, 67 fish, totaling over 400 lbs. Rod buffs in the picture are (kneeling in front): Russell Cox; then (from left to right): Doc Duckett, Sandy Santisteban, guide captain Wally Stovall, Gloria Lopez, and Bill Gresham, Jr. Miss Lopez, secretary-bookkeeper, won $1.00 from everyone on her team for her record catch of the day, a 12 pounder. The other half of the company went kingfishing on April 20, and brought home 49 fish, tipping the scales at 300 lbs.

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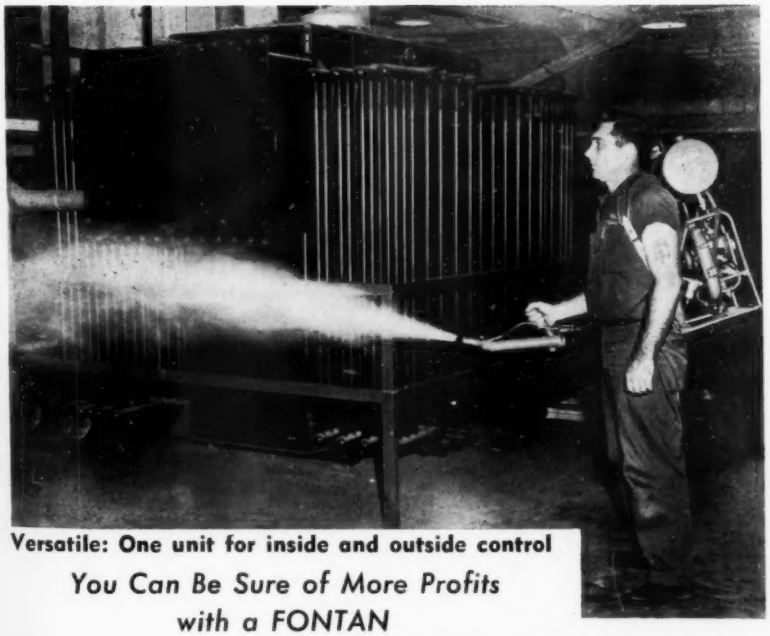

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the University of Delaware, is quoted in stories distributed in his state. Releases in Illinois contain authoritative comments by Dr. George C. Decker, Head of Entomology at the Illinois State Natural History Survey. Termite stories for Kansas readers were credited to Dell E. Gates, extension specialist in entomology at Kansas State University. Newspapers in New Jersey were sent stories with remarks by Dr. Bailey B. Pepper, entomology chief at Rutgers. Articles circulated in Texas opened with observations by C. F. Garner, Texas A & M entomologist.

Army Spots New Bug Invaders

Discovery and subsequent eradication of the "European Chafer," an insect resembling the Japanese beetle in size and coloring, on the Army's Governors Island, N. Y., last summer, was reported by Irving H. Waller, chief entomologist of the 1st U. S. Army Engineers, at a special 4-day Army pest control course held at Governors Island in the latter part of April. The "European Chafer" destroys grass roots. It has also been found along the Belt Parkway in Brooklyn, N. Y., and is believed to have "slipped into the country" via imported nursery stock.

Another invader recently uncovered and stopped was the Mediterranean Snail, a voracious crop destroyer. This mollusk was introduced to the U. S. through materials and belongings shipped from U. S. military bases in Northern Africa, Spain, and France.

Sanitation Violators

Unlawful contamination of food and infestation of dwellings by insects and rodents is bringing seizures or condemnations by Federal, state and local enforcement authorities. Here are some of the latest violations and convictions.

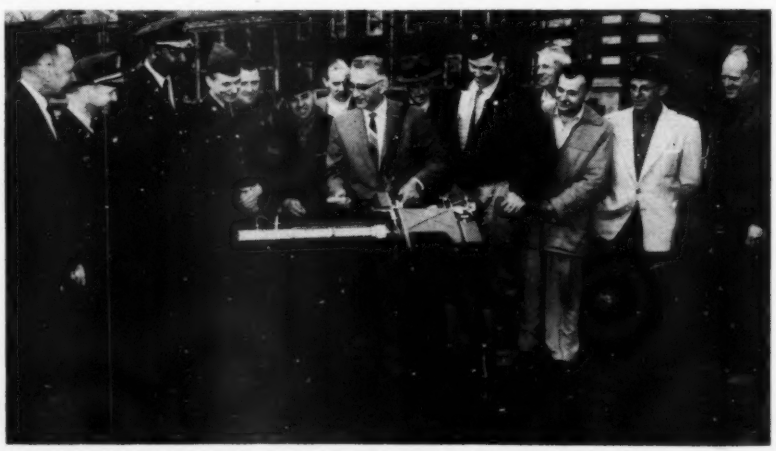
Landlords of buildings in East Harlem, New York City, were fined a total of $25,000 for rat violations, while 3 landlords, who ignored orders to rid their buildings of rats, were ordered by the State Rent Administration to give rent reductions of 10%. Among 16,973 residence buildings and 15,000 commercial buildings that were inspected, 4,924 were found to be infested, or have rat-breeding conditions. Upon re-inspection of 90% of these buildings, 626 summonses were handed out where unsatisfactory conditions still prevailed.

A New York City slumlord was recently fined a maximum of $500 for rat infestation; a short time before he had paid a fine of $50 for a similar violation.

Facing sentence in 30 cases involving nearly 30 violations such as failure to exterminate rats and insects in Harlem, New York, properties, a slumqueen was freed under $1500 bail, and enjoined to clean up conditions immediately. A rooming house operator for 34 years, she has already paid an estimated $18,000 in fines after many Housing Court convictions. The magistrate hinted that she could go to jail.

Unable to pay a $500 fine for rat infestation, a New York City luncheonette operator went to jail for 50 days. He had a record of three previous Health Department violations.

In a 200-block area in eastern



Irving H. Waller (center) First U. S. Army Engineer's Chief Entomologist, demonstrates equipment during a 4-day insect and rodent control training course held at Governors Island, N.Y. during the latter part of April. At extreme left are several instructors: S. C. Dews, Army Engineers, Washington, D.C.; Major R. J. Walsh, First Army Medical Section; and Major Milton Flemings and Specialist-4 Henry Estes, both of the First Army Medical Laboratory.

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and central Harlem, New York City, inspectors found 4,371 of the 17,167 buildings they visited to be infested with rats or to have rat-breeding conditions. Fines totaling $4,650 were imposed on 28 landlords of the inspected buildings who subsequently failed to make improvements. Most of the fines were $150 each, but one was $400. Arrest warrants were issued for 43 landlords who failed to appear.

A candy company in Macon, Georgia, was recently fined $5,000 for producing candy under insanitary conditions while it also contained insect and rodent filth.

A Philadelphia, Pennsylvania, candy manufacturer was fined for the same reason, the firm and partner each had to pay $1,000, and were placed on a 2-year probation.

Peanuts found to be contaminated with rodent filth and held under insanitary conditions resulted in a $3,500 fine for a corporation in Des Moines, Iowa, and a $1,000 fine plus 20c costs for the corporation's secretary treasurer and manager.

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4. Pest Control Equipment Co., 24 North Bond Street, Mt. Vernon, New York
5. Pyrrole Chemical Corp., 817 Spring Lane, Portsmouth, Ohio
6. Hub States Chemical & Equipment Co., 1225 North Windsor St., Indianapolis 1, Indiana

Primer

By Any Other Name: Six

Rodents (Order Rodentia) come in many types; some are of economic value, like beavers (fur; water, soil and wildlife conservation), others are extremely detrimental to man, like rats (destructive and a health hazard). The PCO usually comes to grips with the latter type, but occasionally he may have to control squirrels, or other rodents that stray from rural areas into people's homes or gardens. Some rodents, like rats, should be identified right down to the species, because each may have behavior characteristics which require different methods of control. To see how well you know the species of the rodents you may be called upon to eliminate, see if you can match-up each common name with the proper species it belongs to. This is the last of the "By Any Other Name" series which began in January.

Match-up the numbers with the letters.

1. *Rattus norvegicus*
2. *Rattus rattus*
3. *Erethizon dorsatum*
4. *Mus musculus*
5. *Microtus pennsylvanicus*
6. *Castor canadensis*
7. *Marmota monax*
8. *Oryzomys palustris*
9. *Ondatra zibethicus*
10. *Geomys breviceps*
11. *Peromyscus maniculatus*
12. *Sciurus carolinensis*

__A. Porcupine
__B. Beaver
__C. House mouse
__D. Common house rat, brown rat, or Norway rat
__E. Woodchuck of the East
__F. Eastern meadow mouse
__G. Roof rat, black rat, or ship rat
__H. Deer mouse
__I. Gray squirrel
__J. Pocket gopher
__K. Rice rat
__L. Muskrat

Answers on page 60

Blood Formula Repels Deer

Blood and bone meal repel deer by odor, according to G. M. Weiss, Summerland Research Station, Canada Department of Agriculture. To protect young orchard trees he suggests a cotton bag containing about an ounce of blood and bone meal be tied to them. Protection will last for up to 3 months, Weiss claims.

Dr. Thomas E. Snyder, recognized world authority on termites and their control, gave a brief address on the occasion of Velsicol Chemical Corporation's showing of its film "Built-In Termite Control," at the Statler Hotel, Washington, D.C., recently. Dr. Snyder discussed the importance of soil pretreatment, and touched on techniques that are used. The film itself explains the termite problem and shows how soil pre-treatment prevents termite damage. About 100 persons attended, including pest control operators, building contractors, architects, bankers, realtors, and interested officials of the U. S. Department of Agriculture, Federal Housing Administration, and Veterans Administration. PCOs can obtain the film on either a purchase or free-loan basis from Velsicol Chemical Corp., 330 E. Grand Avenue, Chicago 11, Ill.

Ind. PCOs Hold Regional Meets, Gain Closer Understanding

First reports on the Indiana Pest Control Operators Association's recently innovated regional sub-divisions were given at the Association's Spring meeting, held in the Union Building of Butler University, Indianapolis, April 23. It was the consensus that these regional meetings are worthwhile and should be continued. They are intended for members to discuss local problems, to get to know each other better, and to become better acquainted with the local county agricultural agent.

Active membership lists are being sent to country agricultural agents, prosecuting attorneys, state police, and Chambers of Commerce. Hospitals may also soon be recipients of these lists.

Other highlights for the 26 members and visitors attending this spring meeting were an informative, non-commercial talk on insurance problems, entitled "Multi-Million Dollar Pile-Up" by R. E. Sundrin of the Insurance Institute of Indiana, and a movie on termites, entitled "The Intruders." It was provided by Paul Moore of the Terminix Co. of Indiana, through courtesy of R. R. Heaton and the E. L. Bruce Company, Memphis, Tennessee. It is largely an interview with Dr. Thomas Snyder, reputed termite expert, and is available for free showing from E. L. Bruce Co., or one of its local licensees.

Several members expressed their interest in the coming Purdue PCO correspondence course. They encourage their servicemen to take the course by reimbursing cost of the course upon completion. One company would even add a $100 bonus in addition to paying for the course, which they also request their clerical personnel to take.

Next meeting, to be held in Indianapolis, is tentatively set for August 15 and 16, with discussions on telephone advertising, industry standards, and such topics as members might still suggest.

First Delaware U PC Course Draws More Than 40

At the request of Delaware's Pest Control Association, organized in 1959, the University of Delaware, Newark, organized a short course in pest control. Held at the University's School of Agriculture earlier this year, it drew more than 40 PCOs.

Highlights of the short course were discussions offered by Dr. Ralph Heal, executive secretary of the National Pest Control Association, on "Latest Developments in the Pest Control Industry;" and by Dr. Spencer H. Davis, of Rutgers U., who gave information on "Stopping Molds."

"Insects and Their Relatives," by Dale F. Bray; "Insect Anatomy and Identification," by P. P. Burbutis; and "Snakes of Delaware," by R. F. Darise, all of the University of Del., were other topics of this one day quicky course, which was supplemented with a short textbook, and various discussion periods.

TIFA Fitted for Propane

TIFA, Todd Insecticidal Fog Applicator, is now available for operation with propane and other types of liquid petroleum gas. Operated by one man, the TIFA dispenses a fog of special oils mixed with older or modern insecticides that kill on contact, the manufacturer claims. It is said to leave a protective, lethal residue for weeks, making the equipment economical to operate, as well as to maintain.

Complete information is obtainable from the Products Division, Todd Shipyards Corporation, Columbia & Halleck Streets, Brooklyn 31, N.Y.

Latest FDA Tolerances Available

NAC News and Pesticide Review, February 1960, has a list of the latest Food & Drug Administration pesticide tolerances from official orders published in the Federal Register.

Copies are available free upon request from the National Agricultural Chemicals Association, 1145 19th Street, N.W., Washington 6, D.C.

A hundred roses for a hundred years—Rose Exterminator Company, Detroit, Michigan, marked its 100th anniversary with the presentation of 100 rose bushes to the Kundig Center (for the aged), Detroit, Michigan. The gift was accepted on behalf of the Center by the Very Rev. Msgr. W. F. Suedkamp (left). Among others present at the ceremony were Anna Gerstner, Kundig Center "Campus Resident," who was presented with a bouquet of cut roses; and Harlem B. Ives, Rose vice-president. Centennial rose plant presentations were duplicated in cities throughout the country in which the firm has branch offices.

Two New Insecticides

(from page 46)

August 7, 1959. Entitled the Agricultural Chemicals Amendment to the Federal Insecticide, Fungicide and Rodenticide Act, the purpose of 86-139 is to bring plant regulators, defoliants, nematocides, and desiccants under the federal insecticide act. In addition, these once-unregulated chemicals are not only now considered economic poisons, but if they are used in the protection, storage, or transportation of raw agricultural commodities, they also become pesticides which fall within the jurisdiction of Public Law 518, the Miller Pesticide Amendment to the Food & Drug Act. Where residues may result, exemptions or tolerances must be obtained from the F&DA.

3½ Million Free Publicists

If material is made available, over three and a half million extension-type workers can be used to promote the need for insect and rodent control. M. P. Jones, USDA extension entomologist, reported that of 100 members in the Federal Extension Service, 22 have flannelgraph material on household pests. At the state level, 250 of the 2,500 extension people are interested in this subject, as are over 4,150 county extension agents, 1,281,000 local leaders, and 2,254,000 4-H leaders. All of these public-service personnel welcome visual education materials that get a teaching message across simply, interestingly, and clearly.

This little-known team of free publicists has only been used by a handful of firms in the pest control field. Velsicol Chemical Corp. and Wisconsin Alumni Research Foundation displayed their flannelgraph kits being used by this corps of public educators. The CSMA announced a p-r project that includes a flannelgraph series on flies, mosquitoes, and gnats that will be prepared in cooperation with and used by M. P. Jones' extension outlets.

Garden Pesticide Market

From 60 to 75 million dollars are spent annually for home garden pesticides, according to "Seed World" estimates presented by Dr. Harry L. Haynes of Union Carbide Corp. Such chemicals are used to protect flowers, vegetables, shrubs, trees, small berries, fruits, lawns, and terraces, from insects, fungi, and plant diseases and weeds, he said.

Up to World War II, home garden pesticides consisted mostly of pyrethrum, rotenone, lead arsenate, paris green, oil mixture and lime sulfur. World War II and the years after it have brought the "Golden Age" of organic pesticides for the grower, industrial, and home garden use, Haynes said. Today there are a total of 236 commercial chemicals in over 7,000 branded formulations.

"In my opinion, we have not informed the public of the true value of our products and we have not told the consumer in the simplest terms what we have available for him," the speaker emphasized. The home garden market holds a large, underdeveloped field that should be cultivated Haynes feels.

The CSMA's 47th annual meeting, December 3-9, will be held at the Hollywood Beach Hotel, Hollywood, Fla.

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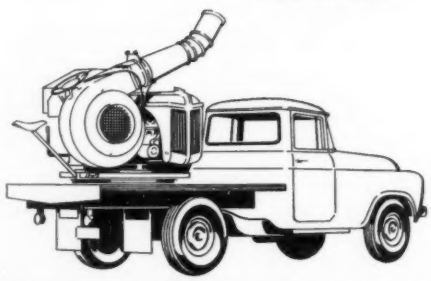

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Calendar

Eastern Div. Penna. Pest Control Assn. Monthly Meeting, Sylvania Hotel, Philadelphia, June 9, 8 p.m.

Arkansas Pest Control Assn. Meeting, Albert Pike Hotel, Little Rock, June 11, 10 a.m.

Washington Pest Control Assn. Monthly Meeting, Washington, D. C., June 20, 8 p.m.

Termite Control Assn. of Calif. Monthly Meeting, 8401 So. Figueroa, Los Angeles, June 21, 7 p.m.

Florida Pest Control Assn. Convention, Galt Ocean Mile Hotel, Fort Lauderdale, June 22-25.

Arkansas PCO Licensing Exam., Dept. of Entomology, College of Agriculture, Fayetteville, July 5, 1 p.m.

Third Annual Course In Advanced Military Entomology, Naval Medical School, National Naval Medical Center, Bethesda, Md., July 10-23.

Tri-State Meeting for PCOs in Georgia, North and South Carolina, Ocean Forest Hotel, Myrtle Beach, S. C., Aug. 4-6.

Ohio Pest Control Association Mid-Summer Meeting, Lincoln Lodge, 4950 W. Broad St., Columbus, Aug. 6, 9 a.m.-5 p.m.

Joint Meeting of the Virginia Pest Control Assn. and the Washington Pest Control Assn., The Cavalier, Virginia Beach, Aug. 19-20.

Western Div. Penna. Pest Control Assn. Monthly Meeting, Webster Hall Hotel, Pittsburgh, Sept. 8, 8 p.m.

Canadian Agric. Chemicals Assn. 8th Annual Meeting and Conference, Britannia Hotel, Lake of Bays, Muskoka, Ontario, Sept. 12-14.

Insect Control Training Course No. 203, Communicable Disease Center, Emory University, Atlanta, Ga., Sept. 12-23.

Maryland Pest Control Assn. Monthly Meeting, Sept. 15.

Alabama PCO Licensing Exam., 1308 1st Ave., N. Birmingham; Courthouse, Gadsden; A.P.I. Ornamental Hort. Field Sta., Mobile; 882 State Office Bldg., Montgomery; Courthouse, Decatur; Sept. 20, 8:30 a.m.

New Jersey Pest Control Assn. Monthly Meeting, Library of the Entomology Bldg., Rutgers University, New Brunswick, Sept. 21, 8 p.m.

Rodent Control Training Course No. 211, Communicable Disease Center, Emory University, Atlanta, Ga., Sept. 26-Oct. 7.

National Pest Control Assn. 27th Annual Convention and Trade Show, Mayo Hotel, Tulsa, Okla., Oct. 16-20.

Mosquito Control Training Course No. 231, Communicable Disease Center, Emory University, Atlanta, Ga., Oct. 31 - Nov. 4.

Virginia PCO Short Course, Virginia Polytechnic Institute, Blacksburg, Nov. 8-10.

Kentucky Pest Control Assn. Meeting, Campbell House, Lexington, Ky., Nov. 21-22, 10 a.m.

Texas Pest Control Assn. Annual Convention, The Gunter Hotel, San Antonio, Nov. 30 - Dec. 3.

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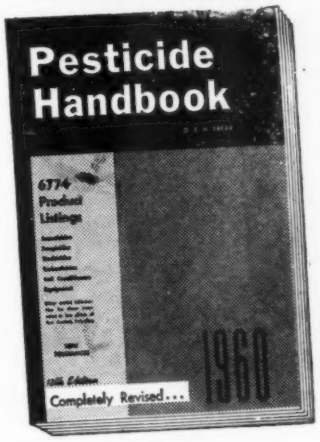

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Infestation Report

Contains pertinent portions of the Department of Agriculture's Cooperative Economic Insect Report, material from university entomology departments and reports from readers. PCOs noticing infestations in their own areas are urged to communicate with Pest Control so their information may be added to this infestation report.

CARPENTER ANTS
(Camponotus spp.)

Maryland: C. pennsylvanicus present in a house at Silver Spring, Montgomery County. **Pennsylvania:** Winged forms of unspecified species present around homes in Clinton County.

IMPORTED FIRE ANT
(Solenopsis saevissima richteri)

Arkansas: Specimens continue to be found in Union County. **Louisiana:** Found in Red River Parish for the first time during February. **Texas:** Surveys have revealed 434,988 acres of new infestations in counties under regulation. All known infestations have been treated in San Antonio.

LARGER YELLOW ANT
(Lasius interjectus)

Maryland: Winged and non-winged forms noted in basements of homes in Montgomery, Prince Georges and Anne Arundel Counties.

A WEST INDIAN ACROBATIC ANT
(Crematogaster steinheili, Forel)

Puerto Rico: Was found to be unusually numerous by Francisco Sein, former entomologist at the Agr. Expt. Sta., Univ. of Puerto Rico, in his home at Punta Maria, Puerto Rico. According to him, they nested in a hollow cavity in the side wall of a window into which was inserted part of a metal window shade. The ants appeared at night on his kitchen table. When he offered them a choice of sugar, rice cooked in grease and hamburger, they ate the hamburger greedily, the rice next and showed little desire for the sugar. C. steinheili is widely distributed in the West Indies and is a common Puerto Rican ant. It normally nests outdoors in rotting wood, cavities in twigs, under bark, in insect cocoons and between the leaf sheaths of Tillandsia. The workers are noted attendants on honeydew excreting insects and often build sheds over their hosts. It is believed that this is the first time that the species has been reported as a house pest in Puerto Rico.

CARPENTER BEE
(Xylocopa virginica)

Delaware: Common in northern New Castle county, attempting to start nests in woodwork.

BED BUG
(Cimex lectularius)

Nevada: Medium infestation in a home in Las Vegas, Clark County.

BOXELDER BUG
(Leptocoris trivittatus)

Delaware: Very numerous in several homes in New Castle county. **Maryland:** Causing a nuisance by entering homes in Baltimore, Montgomery and Prince Georges County. **New Mexico:** Nuisance in and around homes in Albuquerque area, Bernalillo County. **Pennsylvania:** Very abundant on outside of home in Green County. **Wyoming:** A serious problem around some homes in Cheyenne, Laramie County.

CARPET BEETLES
(Anthrenus flavipes)

Maryland: Adults and larvae noted in homes in Charles, Montgomery and Prince Georges Counties. Larvae of Attagenus piceus were noted in a home at Linthicum Heights, Anne Arundel County. **North Carolina:** Adults of an undetermined species in wool rugs in a house and larvae causing severe damage to a wool sofa in another house; both in Forsyth County.

VARIED CARPET BEETLE
(Anthrenus verbasci)

Delaware: Larvae present in feed mill in southern Sussex County.

HOUSE CENTIPEDE
(Scutigera coleoptrata)

Florida: Collected at Alachua County courthouse building in Gainesville. This is the first record in the county.

CLOVER MITE
(Bryobia praetiosa)

Delaware: Large numbers invading houses in New Castle County, particularly where lawns are relatively new. Continues to invade homes in large numbers in New Castle County. **Maryland:** Entering homes at numerous localities in central and southern sections. **Nevada:** Invading homes in Reno-Sparks area, Washoe County. **North Carolina:** Large numbers invading a house in Wake County. **Oklahoma:** Becoming active around dwellings and causing concern to homeowners in central, east central and south central areas. **Utah:** Troublesome in homes at Salt Lake City, Murray and at Logan in northern area. **Washington:** Entering homes at Union Gap, Yakima County. **Wyoming:** Infesting lawns and homes in Cheyenne, Laramie County, and Laramie, Albany County.

BROWN-BANDED ROACH
(Supella supellectilium)

Maryland: Infestation present in home in Rockville, Montgomery County. **Pennsylvania:** Heavy infestation present in a home in Delaware County. **Utah:** Has become a more serious pest during the past 2 years in Washington County. **Wyoming:** Infesting dwellings in Laramie, Albany County.

A BROWN-BANDED ROACH PARASITE
(Comperia merceti)

Missouri: Picked up in a house in Jefferson City. This is a first record in the State.

TERMITES

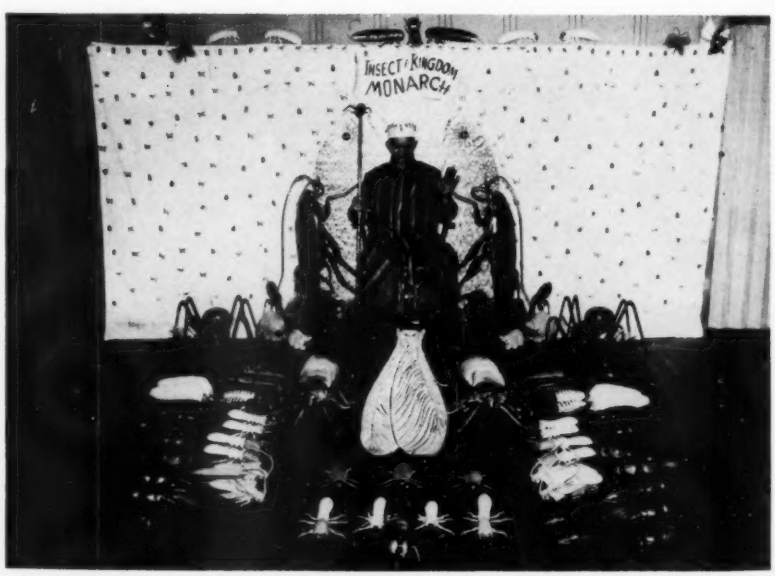
Pennsylvania: Swarming of unspecified species was more common than usual in Clinton County during late March. **Washington:** R. hesperus attacking dead bark of Douglas-fir adjacent to buildings found infested. Trees apparently not damaged. Infestation in shipyard at Bremerton.

EASTERN SUBTERRANEAN TERMITE
(Reticulitermes flavipes)

Delaware: Several new infestations of R. flavipes in homes in New Castle County. **Maryland:** Swarming of reproductive forms common in south central section of the State. Winged forms noted in a home at Silver Springs, Montgomery County. **Missouri:** Swarming in a house in Fredericktown, Madison County. Several swarms observed in houses in the Malden area of Dunklin. **North Carolina:** In flight in Caldwell and Warren Counties. Swarming in Robeson County. **Ohio:** First swarming in Wooster, Wayne County, noted when temperature reached 71° F. **Oklahoma:** Swarming began in Stillwater area and increased in intensity.

AMERICAN DOG TICK
(Dermacentor variabilis)

Oklahoma: Relatively light adult numbers appearing on dogs in Payne County area. Adults becoming common on dogs in a widespread area in eastern half of the State.



Insect Kingdom Monarch R. D. Erdie, of Insect Model Co., Fairmont, W. Va., poses in full regalia in presence of distinguished members of his court. At the foot of his throne is a giant winged termite paying reverence to "His Majesty," while other courtiers stand guard. Members of Erdie's court are only a few of the insect models he manufactures.

Osmun Featured at Ill. PCA Spring Meet

"We still don't know all the answers to the use of DDVP, but the material appears to be the most promising insecticide to appear on the horizon for PCO use in recent years," featured speaker Dr. John V. Osmun, head of Purdue's entomology department, told Illinois Pest Control Association's spring meeting at Chicago's North Park Hotel, April 25. He led the 60 attending association members into a spirited, free-for-all discussion on current industry problems.

Dr. Osmun, considers desiccant dusts a worthy auxiliary pesticide with a definite place in PCO service kits. He pointed out that this non-toxic dust has particular value in areas such as pet shops where contamination is of critical concern, and in wall voids.

R. E. Berns, Aerosol Exterminators, Chicago, read his paper entitled "Observations on the Area Control of Brown Dog Ticks," which was recently published in Modern Veterinary Practice. He stressed the need for simultaneous dipping of infected dogs and treatment of infested premises by PCOs equipped with knowledge to cope with this highly resistant arachnid.

During a business session, members approved establishment of a credit information clearing house through which they will exchange names of their seriously delinquent debtors. Quarterly listings of these debtors will be confidentially circulated among members to help establish credit relationships with potential accounts.

Burton L. Smith, A-Veri-Best Exterminators, Inc., Chicago originator of the system, explained that its real aim is to protect association members against "a group of chronic deadbeats, who drift from PCO to PCO, leaving a string of unpaid pest control bills in their wake."

Pomerantz on PC at Mass. U.

Charles Pomerantz, president of Bell Exterminating Co., New York City, spoke before an audience of entomologists and guests at the University of Massachusetts, Amherst, recently.

Discussing some unusual carpenter ant problems, he used slides to illustrate his methods for successful control. A powdered-milk producing plant, which was infested with Trogoderma beetles, provided Mr. Pomerantz with another challenging problem, which he explained in detail.

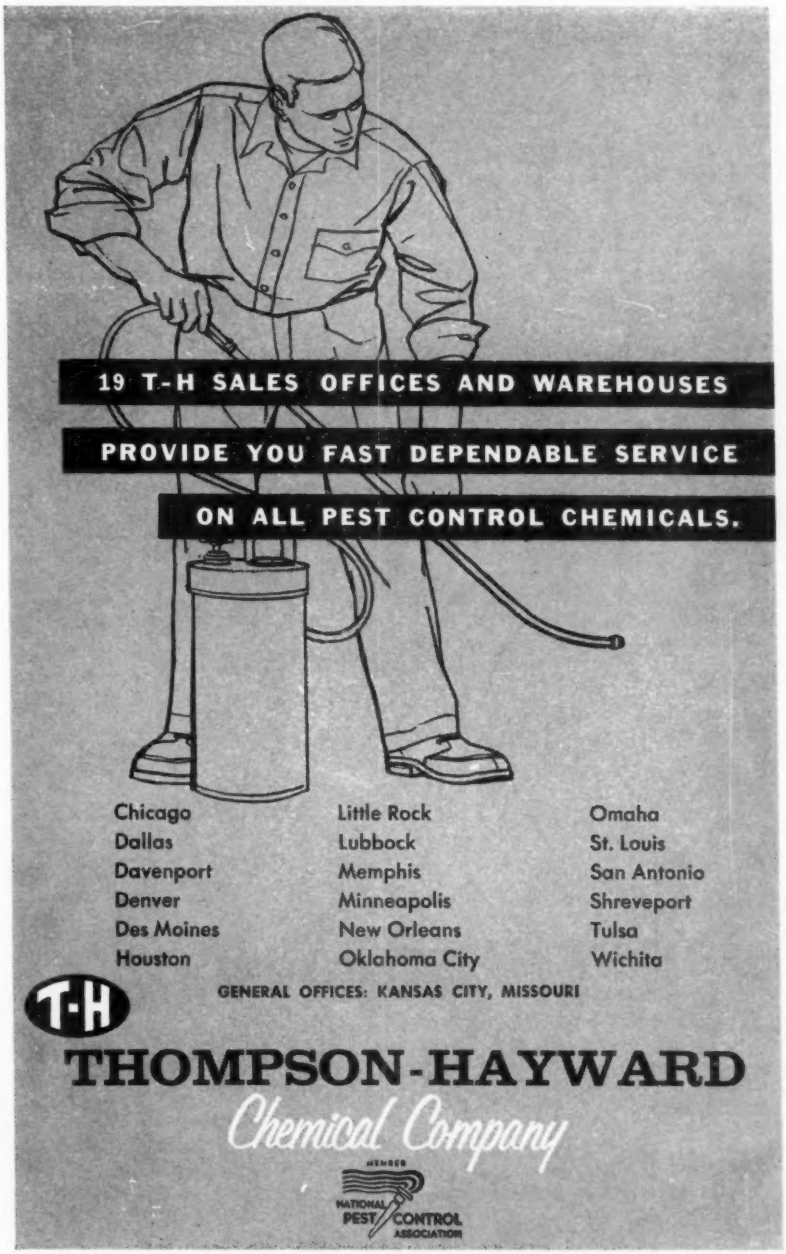
Serviceman Training

(from page 38)

all who qualify. The cash value of awards is often secondary. What counts is the spirit in which an award program is handled.

Other tools to improve the retention of employee loyalty include profit sharing, pensions, adjusted paid vacations, and paid sick leave. Newcomers benefit through a one-week paid vacation after their first year with the company, while fifteen year veterans may be entitled to up to three weeks or more each year.

It should be stressed that employees in general, and your servicemen in particular, work for themselves, not for you or your company. Their stay depends on how the company satisfies their needs and desires. Learn to see it that way in order to keep your valuable employees.



Notebook

TIPS AND IDEAS FROM THE FIELD

Items for More Advanced Equipment Maintenance

by Philip Mayer, Jr.
Evins Exterminating Company
Great Neck, Long Island, New York

Last month I gave you a list of bare essentials every PCO should have for equipment maintenance. Since your sprayers and other pieces of equipment must always be in working order, you must have the tools to keep them that way.

Here are additional items that should be in a PCO tool set-up, if there is someone in the organization with good mechanical aptitude.

1. For soldering operations, a gasoline blow-torch can be used, but for a really fine set-up I like the Bernz-O-Matic complete kit which includes a propane tank, two burner tips and two soldering tips, 6 ft. of hose, and a 10 cubic ft. acetylene tank with a pressure-reducing valve.
2. A one-third horsepower electric motor having a double shaft extension. Equip one end with a rotary wire brush, and the other end with a grindstone. Be sure to buy a plastic faceguard.
3. Two pipe taps, size ⅛" National Pipe Taper and ¼" NPT.
4. Two pipe dies, same sizes as above.
5. One brace and set of bits.
6. One electric and/or hand drill and set of high-speed drill points.
7. One tool for cutting gaskets and washers. This tool fits into the brace listed under item 5. above.
8. One center-punch.
9. One reamer for metal.
10. Complete set of socket-wrenches, including a ratchet handle.
11. Set of files for metal; two or three should be enough.
12. One Morse or similar scale showing proper drill-point sizes for use with different sizes of pipe taps.
13. One hacksaw.

These items are maintenance-tools exclusively and should not be confused with tools you might use for quick repairs in the field.

For major repairs to your equipment, I recommend that you return it to the manufacturer who will have the necessary replacement parts and thus assure you of skilled workmanship and longer use-performance.

PCO maintenance workbench with tools neatly hung on a pegboard described in notebook.

Suppliers' Staff Changes

Geigy Agricultural Chemicals, Division of Geigy Cemical Corp., has promoted **Larry Harman** from sales representative to sales manager of the Northwest sales district, headquartered in Walla Walla, Washington. **Roger Scott** of the company's research staff in Ardsley has been promoted to field research representative in the Pacific Northwest, and is now headquartered in Yakima, Washington. Also located there will be **G. ("Gus") Poletis,** formerly with Cal-Spray in Western Colorado, and now a member of Geigy's sales staff. **Howard S. Beaudoin** has become sales representative serving the Portland, Oregon area. **J. B. ("Bernie") Plant** recently joined Geigy as sales representative on the team of the newly formed Northwest sales district, and is headquartered in Salt Lake City, Utah. **Raymond J. Jefferson,** formerly with the New York Farm Bureau, has become sales representative in Indiana and Kentucky, with headquarters in Indianapolis, Indiana.

Carl S. Weyandt, president and one of the founders of Syntron Company retired April 30 after more than 40 years service. He will continue as a member of the board of directors of Syntron, and of the Link-Belt Company, of which Syntron is a subsidiary. A resident of Indiana, Pa., Weyandt plans to remain active in local business and civic affairs. He is succeeded by **Byron K. Hartman,** who joined Syntron as executive vice-president and general manager in August 1959. He had been associated with the Link-Belt Co. for 21 years.

1959 Cockroach Control Tests

(from page 11)

for longer periods a water suspension of the wettable powder was better. Unsatisfactory kill of cockroaches was obtained from water-based formulations of 1.0% American Cyanamid 18,706 or 1.0% Dimethoate (both prepared from solubilized concentrates), and a 0.5% emulsion of Hercules 5727.

References Cited

Keller, J. C., P. H. Clark, and C. S. Lofgren. 1956. Susceptibility of insecticide-resistant cockroaches to pyrethrins. Pest Control 24(11):14-15, 30.

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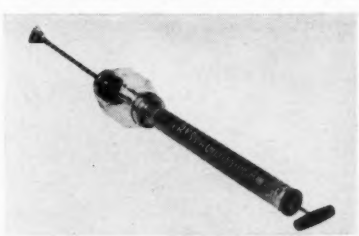
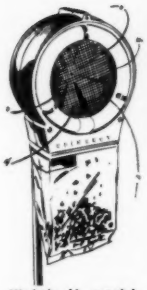


A new Crystal Duster with transparent dust chamber, 18" x 1-3/4" pump, and agitator which is said to break up coagulation, is marketed by R. E. Chapin Manufacturing Works, Inc., Batavia, N.Y. The duster's 40" length makes it possible to dust without stooping or bending, according to the company, which acquired its trade mark from the former Brown Company. An angle nozzle applies dust to upper or under side of leaves, and is removable for heavy volume dusting, the marketer says. Upon request the R. E. Chapin Manufacturing Works, Inc., will supply descriptive literature.



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• **Economical** — costs approximately $1 per month to operate every night. • **Guaranteed** — for 1 year against defects in material and workmanship. • **Results** — your area is cleared of night-flying insects; infectious mosquitoes are eliminated.

Price — $54.50 ppd.
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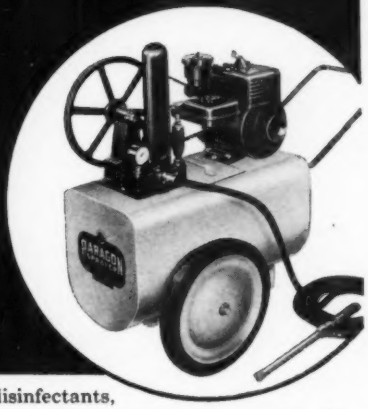

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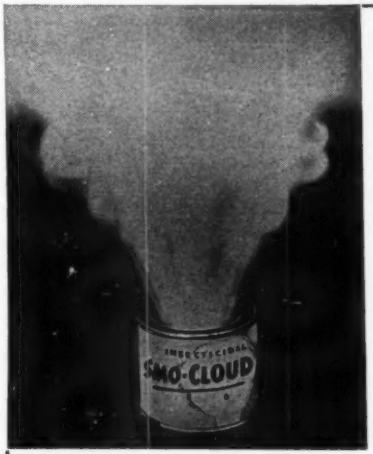

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SALESMAN — Termite control, 14 years experience, married, 43 years old, wants to locate in California. Now selling in the Midwest. Reply Box 530, Pest Control magazine.

HELP WANTED

SALES REPRESENTATIVE for Mid-dle Atlantic States to call on pest control operators and formulators by established East Coast house. Replies treated in strictest confidence. Box 538, Pest Control magazine.

RAPID EXPANSION PROGRAM in Midwest enables us to offer qualified servicemen, salesmen and managers guaranteed salary and commission; opportunity for advancement; permanent year 'round employment; paid vacations, income when ill; outstanding fringe benefits including profit sharing, retirement (pension) plan; medical and surgical, hospitalization insurance; group life insurance, etc. Company pays all premiums. All replies held strictly confidential. Arwell, Inc., Waukegan, Illinois.

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PEST CONTROL BUSINESS — Long established in trade area. Has excellent reputation, high quality clientele. General pest control South Florida grossing $5,500 annually. $1,200 all cash. Box 539, Pest Control magazine.

EXTERMINATING CO. operating in Florida's East Coast and Central section. Excellent business with large contract renewal accounts. This business is one of the largest and most stable in Florida. John E. Dreher, Realtor, 620 Seabreeze Blvd., Daytona Beach, Florida.

WANT TO BUY

FOGGING MACHINES, large or small, gasoline or propane powered; give price and full details. Stewart Thompson, P. O. Box 85, Danville, Virginia.

WILL PAY TOP PRICE for exter-minating business in New York City area. Cash. Replies confidential. Box 439, Pest Control magazine.

Tidwell Receives Orkin Scholarship

Mac A. Tidwell has been awarded the 1959-60 John A. Creighton Scholarship at the University of Florida, Gainesville. The scholarship, sponsored by Orkin Exterminating Company, Atlanta, Georgia, is annually awarded to a junior in entomology on the basis of scholarship, professional promise, and economic need. It was established in 1953, and named for the head of the University's school of entomology.

Mac Tidwell was president of the Science Club of his high school in Gonzalez, Fla., where he received the Bausch & Lomb honorary science award upon graduation in 1957. His entry in the regional science fair that same year won third place.

New High Psi Bean Pump

Incorporating a new principle to provide a pulsation-free stream of spray material, John Bean Division, Food Machinery and Chemical Corp., has introduced a Royalier series of high pressure pumps.

Royaliers, together with the existing Royal, Royalette, and Spartan series, now comprise pumps with a range said to go from 3 to 60 gallons-per-minute. The new J-15 Royalier and J-20 Royalier have capacities of 15 gpm at pressures up to 400, and 20 gpm at pressures up to 300 psi respectively, the manufacturer claims.

Pulsation-free Royalier pumps feature a fully enclosed construction with four corrosion and wear resistant sapphite cylinders, heavy-duty ball bearings and positive action, spring loaded stainless steel disc type valves, according to John Bean.

Royalier pumps are available for use on engine driven and tractor power take-off John Bean sprayers for orchard and tree spraying, equipment cleaning, building sanitation, and brush and weed control.

John Bean Division, Food machinery and Chemical Corp., Lansing 4, Michigan will send complete information upon request.

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Continental Chemiste Corp. 59
Cor-Lite Industries, Inc. 59
Donco, Inc. 21
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Velsicol Chemical Corp. 2nd Cover, 3
Virginia Smelting Co. 37
B. & D. A. Weisburger 59
Whitmire Research Laboratories, Inc. 25
Wood Treating Chemicals Co. 41

Answers to By Any Other Name on page 52

1. D; **2.** G; **3.** A; **4.** C; **5.** F; **6.** B; **7.** E; **8.** K; **9.** L; **10.** J; **11.** H; **12.** I.

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EASY TO USE: Requires no Special Equipment.

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EFFECTIVE TO USE — Follow instructions on can for best results. **This Amazing FUMO-KILL insecticide is by all qualifications, a leader in its field.**

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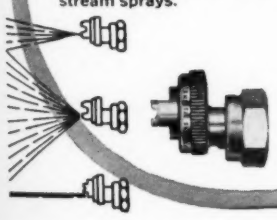

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Pestales

One-Track Mind. Prof. George E. Gould of Purdue's entomology department, doesn't only track professionally (bugs), he also tracks as a hobby, "Kissin' Bridges" that is. Collecting is done by photographs. Scale models are being built by Prof. Gould to reveal the disappearing covered wooden bridges' finer points, like King posts, Queen posts, Burr arches, etc. As for most tracking there's even a covered bridge "hunting season": April and early May, before they "go into hiding" behind emerging spring foliage. There are 149½ specimens in Indiana (half of one bridge was left by a tornado), and 1,150 others elsewhere in the U.S. Happy huntings, Prof!

* * *

Mouse heroine. Mice aren't always pests to be controlled. In fact they aren't even always pests. Ask any biological laboratory worker. They are bred for the special purpose of being test animals. Once in a long while one of those tiny rodents distinguishes itself by work beyond the call of duty. This happened with a crippled mouse. It was dragging its hind feet and thus attracted attention from a laboratory worker. It turned out to be muscular dystrophy. This disease kills some 200,000 U. S. children a year. No medicine is known to stop or cure it. The mouse, named Funnyfoot, was a female, but unable to bear offspring. In order to obtain laboratory animals with this disease, doctors transplanted her ovaries to a healthy female. More Funnyfoots were born and three of them were sent to England. They helped a British research team achieve a major breakthrough in the fight against muscular dystrophy. Victory is not yet in sight, doctors cautioned, but Funnyfoot and her descendants helped a lot to come closer to it.

* * *

Feathering the nest. An innkeeper in Morbach, Germany, kept missing money from his till. When a large bill disappeared in broad daylight, with not a single customer in sight, the innkeeper had to do some profound thinking. Keeping a vigil over his counter he discovered that mice had found a way into the money drawer. Several bills of large denomination served as plush upholstery for their quarters. These mice were bucking themselves up for the kill!

* * *

Heads Tex Bruce-Terminix Co. John R. Moore has been appointed manager of the pest control division of Bruce-Terminix Company, Houston, Texas, according to J. E. Penland, Jr., general-manager. Mooney is a graduate of Sam Houston State Teachers College in Huntsville, and has had extensive training and experience in general pest control.

* * *

Good for something. Although the hairless mutants of mice must have plunged the manufacturers of mice haircombs, mice shampoos and mice home permanents into despair, there was a recent turn for the better. "Naked" mice turned their deficiency into an asset, an asset for the good of humanity. Crossbreeding experiments at Iowa State College at Ames with "naked" specimen gave a clue to a mysterious heredity problem, to increase our knowledge.

* * *

New VIP for Termitrol. Lawrence ("Larry") E. Davis has been promoted to vice-president and service director of Termitrol Engineers, Inc., Clearwater, Fla. According to Frank X. Kern, vice-president and general manager, Davis' new duties will be in addition to managing the Clearwater office. Immediately after he obtained his master's degree in entomology from the University of California, Larry joined the company.

* * *

Pants in the ants. In Mafeking, South Africa, women, and not a few of them, have been clamoring about disappearing underclothes. When hung on washlines they disappeared overnight. The culprits? Black ants! Used them as their midnight snacks. Policemen observed that thousands of ants came during the night and made short order of pants, panties, et al . . .

* * *

Scared to death. For squirrels, chipmunks and field mice to be scared to death is not a manner of speaking but dead serious business. Dr. H. S. Mosby, wildlife researcher at Virginia Tech, says that these little rodents, vital to research, often suffer fatal shock when trapped alive. This is apparently due to nervous tension. Would pre-baiting with a tranquilizer be the answer to this traumatic rodent experience?

New odor-masking agent for use in

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Formulations

Developed at the request of many Pest Control Operators, DIASCENT is an amazingly effective odor mask and freshener for finished formulations made with Diazinon. It is usable in oil or water-based products and its wonderful odor-covering power makes it extremely economical. One pound will actually odor-mask 64 gallons of finished formulation! *Why not order a trial pound for your own tests today.*

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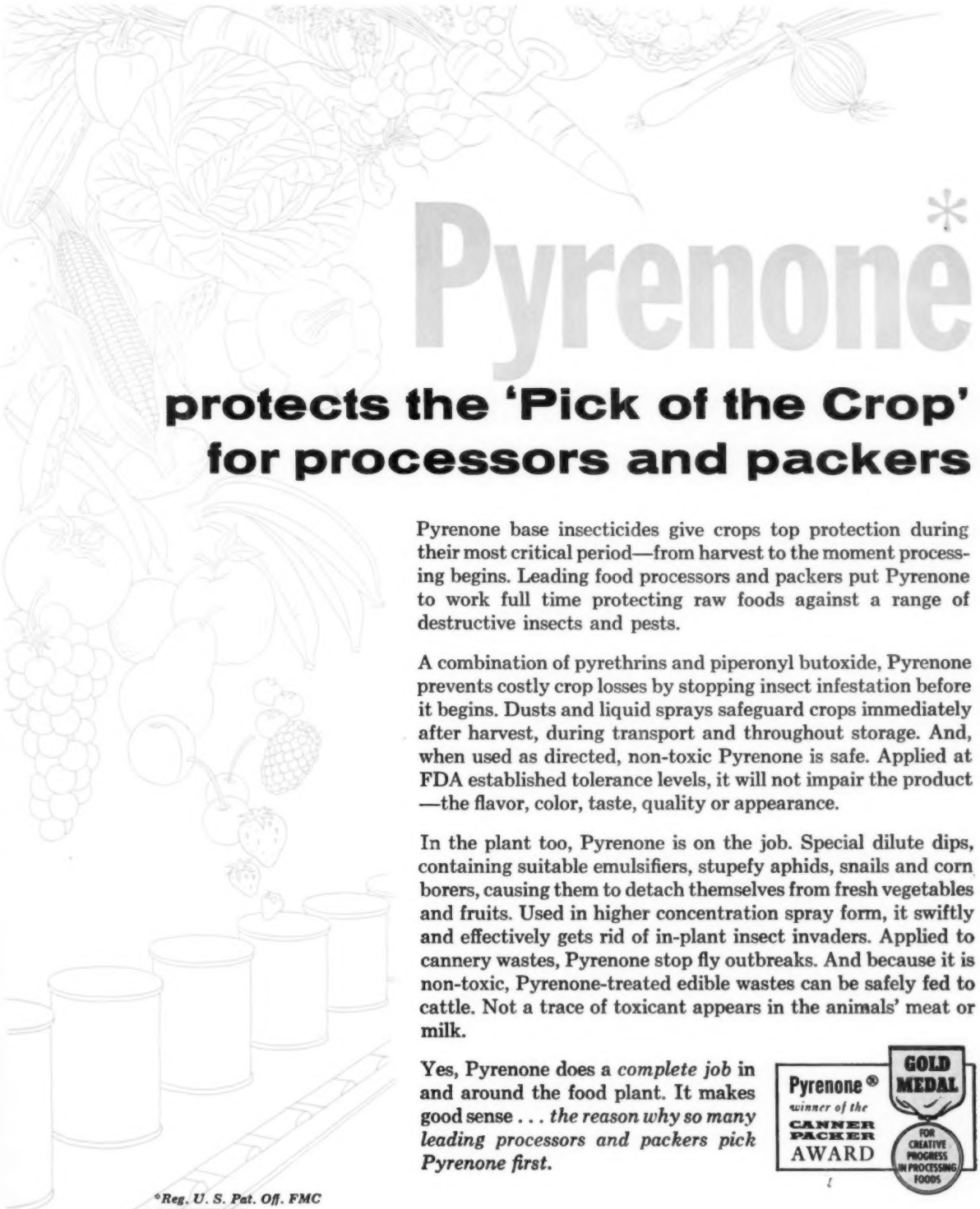

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Pyrenone base insecticides give crops top protection during their most critical period—from harvest to the moment processing begins. Leading food processors and packers put Pyrenone to work full time protecting raw foods against a range of destructive insects and pests.

A combination of pyrethrins and piperonyl butoxide, Pyrenone prevents costly crop losses by stopping insect infestation before it begins. Dusts and liquid sprays safeguard crops immediately after harvest, during transport and throughout storage. And, when used as directed, non-toxic Pyrenone is safe. Applied at FDA established tolerance levels, it will not impair the product —the flavor, color, taste, quality or appearance.

In the plant too, Pyrenone is on the job. Special dilute dips, containing suitable emulsifiers, stupefy aphids, snails and corn borers, causing them to detach themselves from fresh vegetables and fruits. Used in higher concentration spray form, it swiftly and effectively gets rid of in-plant insect invaders. Applied to cannery wastes, Pyrenone stop fly outbreaks. And because it is non-toxic, Pyrenone-treated edible wastes can be safely fed to cattle. Not a trace of toxicant appears in the animals' meat or milk.

Yes, Pyrenone does a *complete job* in and around the food plant. It makes good sense . . . *the reason why so many leading processors and packers pick Pyrenone first.*

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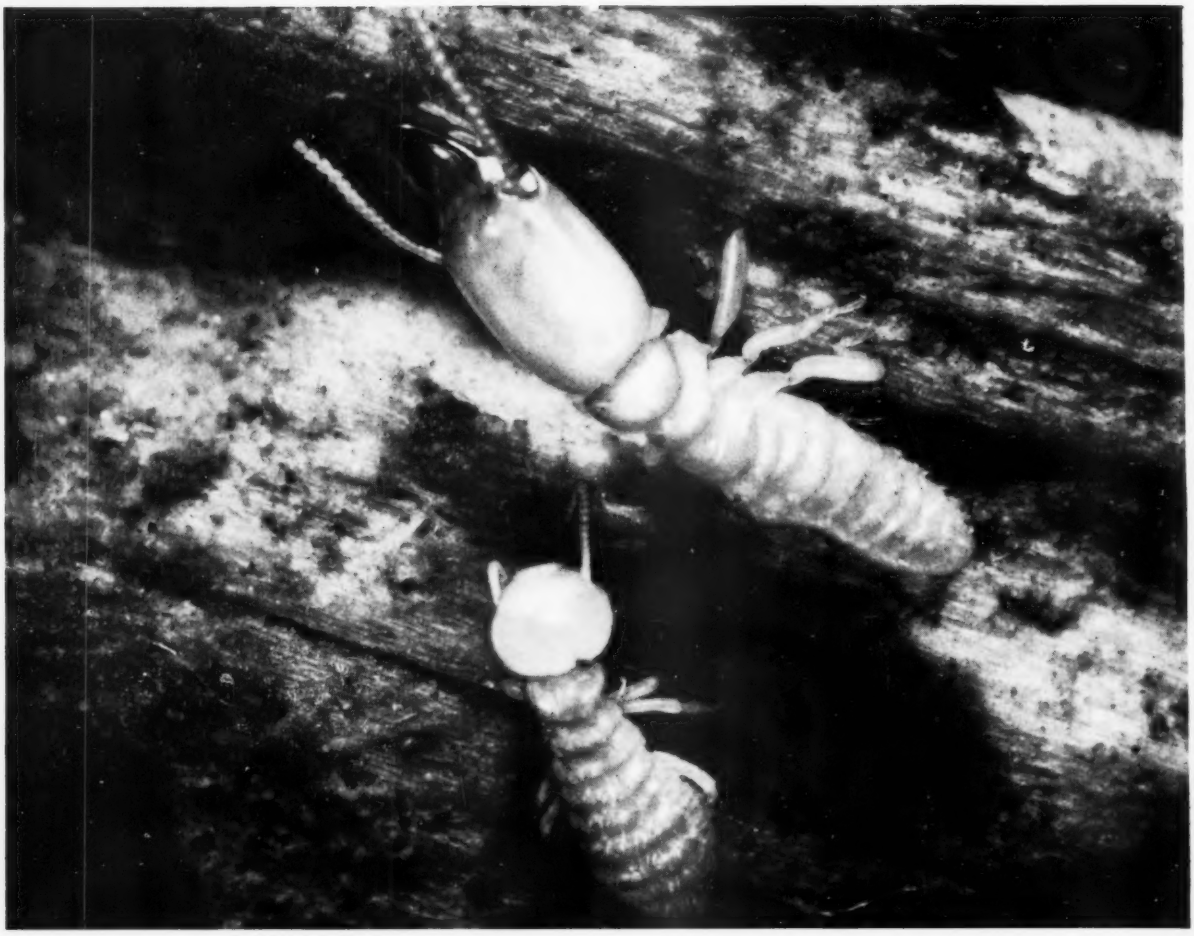

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